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PANASSYUK (M. P.). Основные выводы научно-исследовательских работ ВНИС за 1937 год. [Main results of the scientific research work during 1937 of the Pan-Soviet Scientific Research Institute for the Sugar Industry (VNIS).]—483 pp., 30 figs., 31 diags., 14 graphs, Пищепромиздат [Publ. Off. Food Industry], Leningrad, 1939.

This is a collection of papers arranged on the same lines as in the previous year [*R.A.M.*, xvii, p. 367].

Mme N. I. SALUNSKAYA (pp. 253–255) states that 1 per cent. emulsion of copper naphthenate (containing 1 per cent. copper) reduced infection by *Cercospora* [*beticola*: ibid., xviii, p. 647] in sugar beet by 21 per cent. as compared with reductions of 36·4 and 36 per cent. obtained with Bordeaux mixture and copper-lime dust, respectively. Observations and experiments showed that mass infection by *C. beticola* occurs when the air humidity does not fall below 85 per cent. during the night and 55 per cent. during the day for at least two to three days, and when the minimum temperature does not fall below 12° C. Both Bordeaux mixture and copper-lime dust gave larger increases in yield and greater reductions in infection with *C. beticola*, when applied on days when the above-mentioned conditions prevail, than at fixed intervals of 15 days.

V. P. MURAVYEFF, Z. A. POZHAR, and K. I. VITAS (pp. 255–257) studied the effect of vernalization of sugar beet seeds (e.g., by exposure to 100 per cent. humidity for two days at 25° C.) on the incidence of root disease [ibid., xvi, p. 790]. All methods of vernalization were found to increase the incidence of *Fusarium* sp. (57 to 100 per cent. as against 22 per cent. in the control) and of bacteria (38 to 100 per cent. as against 22), and to decrease that of *Mucor* sp. (0 to 20 per cent. compared with 100) and of dark moulds [unspecified] (11 to 75 per cent. as against 95). Soaking had a similar but slightly weaker effect on the incidence of micro-organisms in the seedlings. Long periods of vernalization resulted in up to 82 per cent. root rot infection in the field. Seed disinfection combined with vernalization and soaking in all cases reduced the amount of infection, the best results being obtained with germisan and the preparation AB. A comparison of seedlings raised from untreated and vernalized seeds showed in 23 out of 25 sets of experiments that the latter gave a high percentage of germination with a larger proportion of healthy seedlings, and a greater average weight of seedlings than the former.

S. F. Morotchkovski and K. I. Vitas (pp. 257–260) found that strains of *Botrytis cinerea* isolated from sugar beet, the soil, geranium [*Pelargonium*], rose, lemon, *Primula*, and *Chrysanthemum* were all equally capable of causing storage rot of sugar beet [ibid., xvii, p. 368]. Of other fungi involved in storage rot, *Rhizopus* sp. and *F. culmorum* were as virulent as *B. cinerea*.

Mme N. I. Salunskaya, N. I. Gomolyako, K. I. Vitas, and D. N. Greenberg (pp. 260–262) sum up the results of laboratory and field experiments on the *Rhizoctonia* disease of sugar beet as follows. Soil disinfection with formalin, applied at the rate of 700 l. per hect., reduced the infection by half. The crops grown in rotation with sugar beet are susceptible to *R.* in the following descending order: sugar beet, carrots, clover, lucerne, white clover, and potato, while sainfoin [*Onobrychis sativa*] is not attacked at all. The roots of sugar beet perish mostly during periods of dry and hot weather, preceded by a spell of high temperatures (with a minimum of not below 10°) and fairly abundant rains. The sugar content of roots attacked by *R.* was 2·4 per cent. lower than that of healthy ones, but their weight was the same. The growth of the fungus was best at temperatures of 20° to 30° and retarded at 2° to 6°. The conidial stage, *Tuberculina* sp. [? the *Tuberculina* stage of *Helicobasidium purpureum*: ibid., vi, p. 756; xix, p. 251], was observed for the first time in 1937, characterized by a soft, snow-white aerial mycelium, bearing yellowish-white cushions of conidiophores which later turn brownish-violet with unicellular conidia, 12·5 by 12·5 μ.

Croxall (H. E.) & Ogilvie (L.). **The incorporation of growth hormones in seed dressings.**—*J. Pomol.*, xvii, 4, pp. 362–384, 1940.

In a study on the effect of growth-promoting substances [cf. *R.A.M.*, xix, p. 206] such as α-naphthalene-acetic acid, mixed naphthylidene-acetic acids, and β-indolyl-butyric acid on seed germination and plant growth, dry dressings, comprising a proprietary mercurial and cuprous oxide as bases, with from 5 to 20 parts per million of these hormones were applied to seeds of seven varieties of peas and two of dwarf beans [*Phaseolus vulgaris*]. In the laboratory no improvement in germination was obtained by the application of these dressings. The germination of the pea variety Eclipse was reduced by treatment with cuprous oxide and this injury was not overcome by the incorporation of the hormones in the dressing. Seeds of five varieties sown in sterile soil in the greenhouse and treated with talc, cuprous oxide, and mercurial dressings, all containing hormones, showed an average of 100 to 113 in the rate of emergence as compared with 100 in the untreated control and an average of dry weight of seedlings three weeks after emergence of 110 to 149 as compared with 100 in the untreated control. The mercurial and cuprous oxide dressings used without hormones had a retarding effect on emergence under conditions of high temperature, and cuprous oxide had the same effect on the variety Eclipse when the soil moisture was below 20 per cent. saturation, but the rate of emergence was raised to about the level of the untreated control by the incorporation of the hormones in these dressings. Grown in soil contaminated with damping-off fungi (particularly *Pythium* spp.) seeds of

the pea variety The Lincoln treated with dressings containing hormones showed 62 to 82 per cent. emergence as compared with 24 per cent. in the untreated control and 52 per cent. in seeds receiving the mercurial dressing without hormones. Similar results were obtained with other varieties of peas and one of dwarf beans. In field trials during summer the crop yields obtained from seeds of varieties Foremost, Surprise, and The Lincoln treated with dressings containing hormones were greater by up to 80 per cent. than those obtained with the same dressings without hormones and in each case greater than from untreated seeds. The effect of dressings containing hormones varied considerably with the different varieties and dissimilar external conditions. No single concentration of either of the hormones tested gave a maximum stimulation at all stages of growth, to all varieties, and under all conditions, but it appears that dressings containing 5 p.p.m. of α-naphthaleneacetic acid and mixed naphthylidene-acetic acids may safely be applied to the pea and bean varieties used in these tests.

Glasscock (H. H.) & Wain (R. L.). **Distribution of manganese in the Pea seed in relation to marsh spot.**—*J. agric. Sci.*, xxx, 1, pp. 132–140, 1 fig., 1940.

Recent investigations having demonstrated the importance of manganese deficiency in the soil in the etiology of marsh spot of peas [*R.A.M.*, xix, p. 187], the writers carried out analyses at the South-Eastern Agricultural College, Wye, Kent, to determine the distribution of the element in diseased seeds of the Harrison's Glory variety from the most severely affected of the 743 samples of seed examined in the 1933–4 survey of Romney Marsh soils by Furneaux and Glasscock [ibid., xv, p. 626]. The methods of analysis used were those described by M. B. Richards (*Analyst*, lv, p. 554, 1930) and Wain (*J.S.-E. agric. Coll. Wye*, xlii, p. 146, 1938). No loss of manganese resulting from the preliminary immersion of the seeds for 24 hours in distilled water, soaked peas were used for dissection in preference to dry ones.

The minimum manganese content in diseased peas was found in the peripheral cotyledonary tissues (5 p.p.m.), followed by the germ (3) and seed coat (2), whereas in a healthy sample used for comparison not only were the values much higher but their distribution was different, ranging from 15 p.p.m. in the germ to 4 in the seed coat, with intermediate quantities in the cotyledon (11 and 6, respectively, in the outer and inner tissues).

A given weight of small peas of the diseased sample was found to contain less manganese than the corresponding weight of large ones (average of six determinations 3·4 and 4·1 p.p.m., respectively), whereas in the healthy material the relationship between size and manganese content was reversed (average of seven determinations, 8·7 large, 9·3 small). These discrepancies in the manganese contents of different size groups suggest the advisability of selecting peas of uniform dimensions for analytical purposes.

The low manganese value of peas suffering from marsh spot in comparison with that of healthy ones is tentatively attributed to the migration of the cell contents from necrotic pockets in the

starch-containing cotyledonary tissues, where the bulk of the element normally resides.

Loos (C. A.). **A blight of Carrot leaves.**—*Trop. Agriculturist*, xciii, 6, pp. 343–345, 1 pl., 1939.

The carrot disease caused by *Macrosporium carotae* [*R.A.M.*, xviii, p. 444] is recorded for the first time from Ceylon. It was observed in 1939 in a garden at St. Coombs, where a whole bed was wilted within three weeks, most of the leaves being dead. It is thought probable that the exceptionally wet conditions of that season had favoured the development of the disease. No control measures were attempted other than the uprooting of the bed. Spraying is only considered necessary in Ceylon in very wet weather.

Jones (H. A.), Porter (D. R.), & Leach (L. D.). **Breeding for resistance to Onion downy mildew caused by Peronospora destructor.**—*Hilgardia*, xii, 9, pp. 531–550, 6 figs., 1939.

Onion downy mildew (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xvii, p. 647; xviii, p. 778] frequently attains epidemic proportions in California, where the losses sustained by seed-growers range from 0 to 80 per cent., weather conditions being the chief controlling factor. During the past 19 years the annual reduction in seed yield due to infection has been 10 per cent. or more in six seasons, with a maximum of between 60 and 80 per cent. in 1925, and several annual losses of over 40 per cent.

Practical difficulties exist in the control of downy mildew, especially the poor wetting qualities of the waxy surface of onion leaves and stalks, and the necessity of frequent spray applications which are almost impossible to carry out when required since the soil is frequently too wet. These difficulties make the development of resistant varieties very desirable. In work on these lines a number of onion varieties were tested and three sources of resistance have been found. The most promising is strain 13–53, a male-sterile selection from the Italian Red variety; the seedstalks are immune, and the foliage is highly resistant. Another strain of Italian Red, 13–20–3, also shows seedstalk immunity, though the foliage is only slightly resistant. In type, 13–20–3 is superior to 13–53. Seedstalk immunity was also found in 1934 in an F_1 hybrid between Red 21 and two inbred lines of Stockton Yellow Flat, viz., 50–6 and 50–6–1. Some F_3 and back-cross populations with 13–53 as the resistant parent are very promising. No infection was observed on garlic.

Jagger (I. C.). **Brown blight of Lettuce.**—*Phytopathology*, xxx, 1, pp. 53–64, 5 figs., 1940.

This is a preliminary report, found among the late author's papers, on his investigations of brown blight of lettuce in the Imperial Valley of California from 1922 to 1927 [*R.A.M.*, viii, p. 286]. In addition to information already presented, it has been found that the disease is soil-borne, the incidence increasing from 1 per cent. in the first to 75 and upwards in the third or fourth crop. A root parasite is suspected as the agent of the disturbance, an hypothesis borne out by

the results of soil sterilization experiments, in which complete control was effected by one hour's steaming at 10 to 15 lb. pressure and by drenching with 1 in 20 formaldehyde. The nature of the pathogen is still obscure. *Asterocystis radicis* [*Olpidium brassicae*: ibid., xviii, p. 821] is commonly present in the epidermal cells and root hairs of diseased plants, but the striking similarity of the disease to the soil-borne wheat mosaic suggests a virus agent. Attempts at the transmission of the symptoms by means of grafting and insects, however, have been unsuccessful. Through selection from the very susceptible, widely grown New York variety a highly resistant strain has been secured which is coming into commercial use under the name of Imperial No. 2.

Mémento [du Service de la] Défense des Végétaux [Maroc]. [Memoranda of the Plant Protection Service of Morocco.]—20, 21, 24, 27 pp., 6 pl., 1939.

Nos. 20, 21, and 24 of this series of semi-popular leaflets, deal, respectively, with shot hole (*Clasterosporium carpophilum*) of stone fruits, apple and pear scab (*Venturia inaequalis* and *V. pirina*) [cf. *R.A.M.*, xvi, p. 389], and vine powdery mildew (*Uncinula spiralis*) [*U. necator*] in French Morocco. Against the last named, growers are advised to mix lime or gypsum with the sulphur dust in the ratio of 1 : 2 from the second treatment onwards (in case of very hot weather 1 : 1 for the third application and following) in order to avoid scorching. Colloidal sulphur has been found in Algeria to be more effective than the dust in overcast and rainy weather during April and May, but after this period, when the temperature rises above 20° C., the dry product is preferable. Potassium permanganate [ibid., xvi, p. 795] is an excellent fungicide but exerts no prophylactic effect.

Osterwalder (A.). **Vom Inkubationskalender der Peronospora.** [On the *Peronospora* incubation calendar.]—*Schweiz. Z. Obst- u. Weinb.*, xlviii, 26, pp. 519–522, 1939; xlix, 1, pp. 3–9, 2 graphs, 1940.

This is a critical evaluation, based on the results of regional observations in Switzerland and a perusal of the pertinent records from other countries, of the practical utility of K. Müller's incubation calendar for the prediction of outbreaks of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] with a view to the timely application of control measures [*R.A.M.*, x, p. 432]. The conclusion reached is that the method is reliable only in districts with a relatively dry climate, the rapid succession of secondary infections in localities subject to heavy precipitation precluding accurate forecasts of the critical dates for spraying.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 2, pp. 79–82, 4 figs., 1940.

Scattered barberry plants may still be found in the cooler parts of New South Wales, though it is incumbent on their owners to see that they are eradicated. Numerous hedges and plants of *Berberis aristata* occur in the Bowral-Bundanoon district, and inoculation tests by Dr. W. L. Waterhouse showed this species to be resistant to wheat rust [*Puccinia graminis*].

French beans [*Phaseolus vulgaris*] in coastal areas are commonly affected in late summer and autumn by angular leaf spot (*Isariopsis griseola*) [*R.A.M.*, xvi, p. 564]. Young plants are not usually affected, and the fungus, which appears to be a relatively weak parasite, under normal conditions only attacks the older leaves. The control measures suggested consist in a three or four years' rotation and the destruction of diseased plants at the end of every season by burning or deep ploughing.

Citrus brown rot (*Phytophthora hibernalis*) [ibid., xvii, p. 313] is not generally important in New South Wales, but causes heavy loss in some localities, particularly in the Windsor and Wingham areas, which are subject to flooding, and in low-lying parts of the Gosford-Wyong districts which are either flooded periodically or are kept damp by seepage. The heaviest losses occur in seasons in which heavy rainfall is experienced in autumn and winter. The control methods advised include pruning away the lower branches and spraying thoroughly with Bordeaux mixture-oil (4–4–80–½) in early April, before or immediately after the first heavy autumn rains.

To prevent stickiness in the compost used for the growing of mushrooms [*Psalliota* spp.] the incorporation of gypsum and superphosphate is advised [ibid., xviii, p. 230].

Martyn (E. B.). **Report on the Botanical and Mycological Division for the year 1938.**—*Div. Rep. Dep. Agric. Brit. Guiana, 1938*, pp. 81–82, 1940.

This report on plant disease work in British Guiana [cf. *R.A.M.*, xvii, p. 298] contains the following items of interest. Abnormally wet weather, with no 'spring' dry season, in 1938 favoured the development of banana leaf spot (*Cercospora*) [*musae*: ibid., xvi, p. 156]. The abnormal weather was also probably chiefly responsible for an exceptionally severe infection of coffee by *Sclerotium coffeicola* [ibid., xiv, p. 184], which became very noticeable in younger plantations on the Barima and Aruka rivers in September. Frog eye (*C. nicotianae*) and mosaic were prevalent on tobacco. Several bad attacks of tomato mosaic occurred in February, and Sinebone beans (*Phaseolus vulgaris* var.) were also affected by mosaic, both these diseases appearing to be aggravated by wet weather.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1938–39*, Part I, pp. 99–124, 2 figs., 1939.

This report on plant disease work in Iowa in 1938–9 [*R.A.M.*, xviii, p. 157] contains, *inter alia*, the following items of interest. Further studies by S. G. Younkin and I. E. Melhus on failures in watermelon seedlings showed that species of *Pythium*, *Rhizoctonia*, and *Fusarium* were constantly associated with damping-off [ibid., xviii, p. 84]. Isolations from plantings made at weekly intervals from 13th April to 30th May showed that *F.* spp. were largely associated with damping-off in the first planting, while *P.* spp. predominated in all subsequent plantings up to 15th May, and thereafter most of the isolates were a species of *R.* Approximately 50 per cent. of the *P.* isolates belonged to *P. irregulare* [loc. cit.], the remaining 50 per cent. belonging to another

morphological group; both groups were pathogenic to watermelon seedlings. *Pythium* was found in the infected tissues of watermelon varieties with light rinds showing blossom-end rot. Of the two isolates obtained in pure culture, one appeared to resemble morphologically the unidentified group of *Pythium* isolates from watermelon seedlings, while the other belonged to a different species. Both isolates were pathogenic to mature and immature watermelon fruits.

H. C. Murphy found that the yield and bushel weight of oats showed a high negative correlation with the amount of crown rust [*Puccinia coronata*] present. As lodging increased with increased yield and increased infection (together or singly), the effect of lodging on yield and that of infection on lodging tended to be nullified. In 20-acre plots at Ames, for every increase of 1 in the coefficient of crown rust there was an average decrease in yield of 0·3053 bush. per acre, so that, in theory, a crown rust coefficient of 100 would give an average decrease in yield of 30·5 bush. per acre. On a similar basis, a 100 coefficient of crown rust would have given decreases of 32·1 and 27 bush. per acre in the nurseries at Ames and Kanawha, respectively. Early maturity was highly beneficial to the susceptible standard varieties, allowing them to escape considerable rust injury. The early resistant selections benefited much less, and as resistance increased the benefit to yield derived from early maturity decreased.

H. C. Murphy and L. C. Burnett state that three new oat varieties, Boone, Marion, and Hancock, adequately resistant to the races of stem rust [*P. graminis*] and smut [*Ustilago avenae* and *U. kolleri*] endemic in the maize belt, are to be distributed to farmers in 1940. Boone (C.I. No. 3305) is a selection from a cross of Victoria × Richland, while Marion and Hancock (C.I. Nos. 3247 and 3346, respectively) are selections from a cross of Markton × Rainbow.

E. L. Waldee states that leaf spot of sugar beet (*Cercospora beticola*) occurred in 1938 in an epidemic form later than usual, and appeared to have a pronounced effect on the amount of sucrose in the roots, no field tested averaging over 14·5 per cent. sugar, though in 1937 some beet crops averaged 16·5 per cent. sugar. Leaf spot generally develops in Iowa between 15th July and 15th August, subsiding when the nights become cooler. From the latter date to 15th October, the weather is generally unfavourable to *C. beticola* but favourable to the beets. As a rule, therefore, the beets largely escape infection after the middle of August and develop normal foliage. The severe late infection in 1938 resulted from exceptionally hot weather towards the end of the season, and was the chief cause of low sugar percentages. Of 20 sugar beet varieties planted in a heavily infected plot, American No. 1936, CLR, and American No. 5 maintained a leaf surface in spite of severe leaf spot.

In tests by I. E. Melhus sweet potato slips treated with P.D.7 (1 in 3·5), semesan bel (1 in 10), and cuprocide 54 (1 in 25) against stem rot [*Fusarium oxysporum* f. 2 and *F. bulbigenum* var. *batatas*: ibid., xix, p. 192] gave, respectively, 77·8, 84·1, and 87·3 per cent. surviving slips and yields of 210, 183·4, and 179·2 bush. per acre, the corresponding figures for the untreated controls being 64·1 per cent. and 156·8 bush. Experimental evidence was obtained that sweet potato slips planted early developed less stem rot than those planted late.

G. Semeniuk and I. E. Melhus state that 85 individual heads of onion seeds obtained from 11 selected inbred lines of Red Globe onion bulbs allowed to cross-pollinate were planted in soil infected with pink root rot (*Phoma terrestris* and *F.* [*vasinfectum* var.] *zonatum* [f. 1]) [ibid., xvii, p. 7], commercial Red Globe seed also being planted for comparison. Four of the 85 lines were as susceptible to infection as the commercial seed, which gave over 75 per cent. rot, but two were of outstanding resistance, and one was moderately resistant.

In greenhouse and field tests by I. E. Melhus, C. S. Reddy, W. F. Buchholtz, and H. C. Murphy, *Pythium graminicolum* and *P. de Baryanum* caused stunting of maize seedlings and prevented seed germination. Seedling stands in soil infected with *P. graminicolum* were lower than stands from seed planted in steamed, uninfected soils. Plants with roots infected by *P. graminicolum* were stunted, and the leaf tips were yellow and blighted; in severe cases the leaves were rolled and drooped. Affected plants gradually wilted and dried up. The principal effect of *P. de Baryanum* was reduction in germination. Of 178 isolates from necrotic lesions on the roots of field-grown oats in 1938, 107 were species of *Pythium*, 60 *Fusarium*, 4 *Rhizoctonia*, and 7 *Helminthosporium*. All of 32 varieties of oats grown in steamed soil infected with *P. de Baryanum* and *P. irregulare* showed typical root lesions. The most resistant varieties were Flughafer, Landhafer, and Columbia. Pre-emergence killing and post-emergence injury were greatest at 10° to 20° C.; at 25° to 30° plants in infected soil had few lesions and were almost as vigorous as the controls in uninfected soil. Evidence obtained indicated that lowering soil temperatures below 15° and liming inhibit lucerne damping-off due to *P. de Baryanum*.

I. E. Melhus, C. S. Reddy, W. F. Buchholtz, and E. L. Waldee state that severe root rot of sugar beets was caused by *Aphanomyces cochlioides* [ibid., xvii, p. 428].

I. E. Melhus observed that *Phomopsis juniperovora* caused severe infection on red cedars [? *Juniperus virginiana*: ibid., xviii, p. 444] and noted a leaf spot (probably caused by *Piggotia fraxini*) of green and white ash [*Fraxinus pennsylvanica* var. *lanceolata* and *F. americana*] in nurseries.

Agricultural research in Colorado. Fifty-first Annual Report Colorado Experiment Station 1937-38.—60 pp., 1938. [Received April, 1940.]

This report [cf. *R.A.M.*, xvii, p. 301] contains the following items of phytopathological interest besides information already noted from another source. *Phytophthora capsici*, the agent of chilli blight [loc. cit.], is parasitic on cucumber fruits in the field, but not on mature plants. Strains of the fungus from cucumber display a sexual reaction differing from that manifested by those isolated from dying chilli plants. Selections from field chillies have given evidence of resistance to the disease. Resistance to lettuce tipburn [ibid., xv, p. 559] has been shown by many good lines, seed samples of which have been sent to California for propagation.

The number of new cases of peach mosaic eradicated in 1937 was

3,517 as compared with 9,835 in the previous year. 'Indexing' of all plums in the Palisade area is now in progress, involving the grafting of healthy Elberta scions into the plum tree. Should the latter carry the virus, symptoms of the disease will be expressed on the peach growth, thereby assisting in identification and promoting effective control.

The *Fusarium* sp. responsible for carnation root rot [? *F. dianthi*: ibid., xiii, p. 151] has been observed, in the course of regular visits to Denver greenhouses, to occur in plants showing no external symptoms and to be transmissible through cuttings from such individuals.

BITANCOURT (A. A.). **Brazil: diseases of cultivated or useful plants, observed in the State of São Paulo.**—*Int. Bull. Pl. Prot.*, xiv, 2, pp. 25–27, 1940.

This second list of diseases of economic and ornamental plants in São Paulo, Brazil [*R.A.M.*, xvii, p. 299], records, *inter alia*, *Sphaceloma arachidis* Bitancourt & Jenkins on groundnut, *Chloridium musae* on banana, *Sphaerulina maydis* on maize, *Elsinoe theae* Bitancourt & Jenkins on tea [see below, p. 369], *Leptothyrium pomi* [ibid., xix, p. 291] on vine, *Elsinoe pitangae* Bitancourt & Jenkins on *Eugenia pitanga*, and *Claviceps paspali* on *Paspalum plicatulum* and *P. proliferum*.

HENDRICKX (F. L.). **Observations phytopathologiques à la station de Mulungu en 1938.** [Phytopathological observations at the station of Mulungu in 1938.]—*ex* Rapport annuel pour l'exercice 1938 (2e partie), *Publ. Inst. nat. Étud. agron. Congo Belge*, pp. 117–128, 1939. 25 fr.

In this report [cf. *R.A.M.*, xix, p. 72], the author states that during the period under review coffee roots at Mulungu were infected by *Fomes lignosus* and a species of *Rosellinia*, probably *R. arcuata*, although no fructifications were observed. *F. lignosus* causes important damage at Ngweshe, where it has been present for many years. Infection appeared to be associated with unfavourable soil conditions. Contrary to the prevalent opinion, the shade tree *Leucaena glauca* seemed resistant to attack by this fungus. In affected coffee plantations control should be undertaken by digging draining channels below the level of the impermeable soil surrounding the affected roots, or by liming the soil.

In coffee plantations in wet localities *Corticium salmonicolor* causes damage to the branches. The disease, however, is not important. At Kivu some leaf infection is caused by *Hemileia vastatrix*, and the teleutospores were found in October and November at Mulungu in old uredo lesions. The rust lesions sometimes show the presence of *Verticillium*, *Cladosporium*, *Macrosporium*, and *Fusarium* spp., and a small orange-coloured larva was observed feeding on the uredospores.

Cercospora coffeicola caused severe infection of the leaves of young *Coffea liberica* plants in a nursery at Mulungu. *Glomerella cingulata* also caused leaf infection of coffee, while other leaf spots were due to *Phyllosticta coffeicola*, *Mycosphaerella coffeicola*, and *Phaeosphaeria* sp.

Cephaleuros virescens was found on coffee, tea, *Cinchona*, and other plants.

By far the most serious parasite of coffee fruits at Mulungu is *G. cingulata*, the losses due to this fungus being most severe at altitudes over 2,000 m. In the vicinity of Ngweshe the losses in some plantations amount to 80 per cent. of the estimated crop. At lower altitudes attacks are less virulent, and fruit infection does not necessarily entail loss of the coffee beans. *Cercospora coffeicola*, besides attacking the leaves, also produces slight infection of the pericarp and fleshy mesocarp of the drupes. Serious losses were caused by peduncle rot associated with *G. cingulata* and a species of *Fusarium*.

A species of *Alternaria* was isolated from *Cinchona* seedlings with diseased rootlets grown in pots. A species of *Rosellinia*, found on seedlings of the same host, frequently caused the death of the plants when they were planted out. Trunk and branch infections, leading to wilting, were produced by *Corticium salmonicolor*. *Cinchona ledgeriana* and *C. succirubra* were affected by tracheomycosis, which rapidly proved fatal.

The only root disease of tea observed was due to *Rigidoporus microporus* [*Fomes lignosus*].

Other diseases observed included *Erysiphe polygoni* on potato, *Isariopsis griseola*, *Phytophthora phaseoli*, and *Ascochyta boltshauseri* [ibid., xvi, p. 655] on beans [*Phaseolus* spp.], *Uromyces sojae* and *Ascochyta sojaecola* on soy-bean, and *Puccinia endiviae* [ibid., xv, p. 775] on endive.

Cardoso (J. G. A.). **Mozambique: fungi, bacteria and diseases of unknown origin observed in the Colony.**—*Int. Bull. Pl. Prot.*, xiv, 2, pp. 28–29, 1940.

The following are among the items of interest in this list of fungal, bacterial, and indeterminate diseases of cultivated plants in Mozambique: *Oospora citri-aurantii* and psorosis on orange, *Phyllosticta prunicola* [*R.A.M.*, xviii, p. 534] on peach, *Phyllactinia corylea* on mulberry and papaw, *Cercospora fusca* on pecan, *Melampsorella ricini* and *Cercosporina* [*Cercospora*] *ricinella* on *Ricinus communis*, *Hemileia vastatrix* and *C. coffeicola* on coffee, *Colletotrichum phomoides* and *Bacterium solanacearum* on tomato, leaf curl of tobacco, vine downy mildew (*Plasmopara viticola*), *Sorosporium reilianum* and *Diplodia zeae* on maize, *Ustilago hordei* on barley, *Cordana* [*Scolecotrichum*] *musae* on banana [ibid., xix, p. 158], *Cercospora personata* and rosette on groundnuts, and *Bact. malvacearum* on cotton.

Fedotova (Mme T. I.) & Kasperovicz (Mme Z. S.). Ускоренный метод определения бактериальной зараженности семян с.-х. растений. [A quick method for determining the bacterial contamination of seeds of crop plants].—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 92–93, 1939.

A simple and quick serological method for the determination of seed contamination with various bacterial diseases which proved successful in tests with cotton, wheat, and beans [*Phaseolus vulgaris*] is described as follows. Sera immunized against bacteria known to parasitize the crop under analysis are first prepared; these sera can be stored for

many years without losing their properties. Next, seeds and pieces of plant tissue are placed in test-tubes with a liquid nutritive medium and incubated for several hours to promote bacterial growth; and finally this bacteria-containing liquid, which represents the antigen, is added to the immunized serum. A floccular bacterial precipitate will result if the pathogen against which the serum has been immunized is present. This type of analysis can be entrusted to comparatively untrained persons provided they are supplied with sera prepared in central laboratories, and is, therefore, recommended for wide practical use.

Castellani (E.). **Problemi fitopatologici dell' Impero. Osservazioni ed orientamenti.** [Phytopathological problems of the Empire. Observations and orientations.]—*Agricoltura colon.*, xxxiv, 1, pp. 5–15, 1940.

In this review of phytopathological problems in Italian East Africa the author states that the following [apart from those already noticed from other sources: *R.A.M.*, xviii, pp. 22, 95, 519; xix, pp. 8, 84] are among the chief diseases of native-grown crops: *Puccinia sorghi* [*P. maydis*], *Ustilago zeae*, and *Sorosporium reilianum* on maize, and *P. purpurea*, *Sphacelotheca sorghi*, *S. cruenta*, *Sorosporium reilianum*, and *Tolyposporium ehrenbergii* on sorghum.

Sibilia (C.). **Primi risultati dello studio di razze fisiologiche di Puccinia rubigo-vera tritici in Etiopia.** [First results of the study of physiologic races of *Puccinia rubigo-vera tritici* in Abyssinia.]—*Agricoltura colon.*, xxxiii, 12, pp. 656–659, 1939.

Notes are given on three new physiologic races of *Puccinia triticina* (provisionally designated E2, E3, and E4) isolated from wheat in Abyssinia since the new race L1 was found in Libya [*R.A.M.*, xviii, p. 507]. Race E2 (from native wheat at Ambò, altitude 2,300 m.) gave infection types 3, 1, 1, 4, 1, 0, and 2 on the Carina, Brevit, Webster, Loros, Mediterranean, Hussar, and Democrat varieties, respectively, the corresponding figures for E3 (from Duro Conti 40, at Amaresa, 1,940 m.) being 3, 3, 2, 2, 4, 1–2, and 4, and for E4 (from Riale, Amaresa), 2, 4, 0, 2, 4, 2, and 4. Race E4 differs from 25 only in that it produces type 2 infection on Hussar, and from 58 only in giving types 0 and 2 infection on Webster and Loros, respectively. All three races (as well as L1) failed to infect Malakoff and gave only weak infection on Carina, all four being, apparently, of intermediate virulence.

Fischer (G. J.), Santoro (R.), & Aznarez (M.). **Ensayos de germinación de Trigos sometidos a tratamientos anticriptogamicos.** [Germination experiments with Wheats subjected to fungicidal treatments.]—*Arch. fitotec. Uruguay*, iii, 1, pp. 69–85, 4 figs., 1 graph, 1938. [English and German summaries. Received April, 1940.]

A comprehensive, fully tabulated account is given of the writers' experiments from 1935 to 1937 at the 'La Estanzuela' National Plant

Breeding Institute, Montevideo, Uruguay, on the germinability of wheat seed-grain disinfected with various fungicides against bunt (*Tilletia*) [*caries* and *T. foetens*], and of additional tests by the first-named in the Argentine in 1937–8 on the effect on the same property of the hot-water treatment, with and without the supplementary use of antiseptics.

Copper sulphate, in the form of a ten-minute dip in a 1 per cent. solution, exerted a more or less adverse effect on the germination of all the samples of grain tested, as also did U.T. 2983. Copper carbonate (0·1 to 0·8 cu. mm. per seed) caused no injury, while two preparations of uspulun dust (one modern) were detrimental only at the maximum strength used.

In the experiments with hot water (47° to 48° C., 110 minutes' immersion), the Rafaela 6 variety sustained an appreciable loss of vigour and germinative capacity; Klein Acero, on the other hand, was greatly stimulated by the treatment, while C. Granadero was unaffected as regards germination, but produced a smaller number of robust plants than the control. In the series subjected to antiseptic treatments with and without previous soaking in hot water, the Litoral 1 variety withstood an excess of copper carbonate fairly well; uspulun, on the other hand, caused heavy damage at the maximum strength without removal of the superfluous dust. Granosan was harmful at a strength of 0·0001 gm. per seed and lethal at 2 mg., with or without removal of the excess dust.

Larose (E.) & Vanderwalle (R.). **Nouvelles recherches sur le charbon du Froment.** [New researches on Wheat smut.]—*Bull. Inst. agron. Gembloux*, viii, 3–4, pp. 205–214, 2 figs., 1939. [Flemish, German, and English summaries.]

In further investigations into the resistance of wheat to loose smut (*Ustilago tritici*) [*R.A.M.*, xvi, p. 732] the authors selected the highly susceptible variety Vilmorin 27 as the female, emasculated the plants, and then immediately inoculated them with their own smut and at the same time fertilized them with pollen of the resistant variety Jubilé. In two subsequent experiments the same variety was similarly treated, but was fertilized three days and six days after inoculation, respectively. The seed from these plants gave rise to no smutted plants. At the same time similar experiments were made with Jubilé fertilized by Vilmorin 27 pollen and in this case too the resulting seed gave no infected plants. The results obtained when Vilmorin 27 was fertilized by pollen from Jubilé several days after inoculation, when mycelium was able to penetrate the ovarian tissues deeply, are thought to indicate that resistance is an embryonic character, and the authors express the view that the amount of mycelium developing in the embryo determines the amount of infection developing in the plant and ears.

Certain susceptible wheats were found to give a high percentage of partially infected plants and ears, a result which is attributed to resistance in the host resulting in sparseness of mycelium in the embryo. Evidence was obtained that loose smut can pass from one generation to the next by vegetative infection.

PETIT (A.). **Les principaux produits anticryptogamiques destinés au traitement des semences de Blé et d'Orge.** [The principal fungicidal products intended for the treatment of Wheat and Barley seed.]—*Ann. Serv. bot. Tunis*, xiv–xv (*1937–8*), pp. 53–84, 1939.

Comparative tests [the results of which are tabulated] carried out in Tunis with a large number of dusts for the control of *Tilletia levis* [*T. foetens*], *T. tritici* [*T. caries*], and *Urocystis tritici* on wheat and *Ustilago hordei* on barley demonstrated that complete control resulted from the use of cuprous chloride at the rate of 250 gm. per quintal for bunt and 350 gm. for barley smut. Anhydrous copper sulphate, copper arsenite, and copper oxychloride were somewhat less satisfactory. The addition of 50 per cent. of neutral or acid 'yellow' sulphur to copper salts gives mixtures which will control wheat bunt and barley smut if not more than 0·1 per cent. of spores (by weight) are present. Sulphur reduces the toxicity of cupric oxychloride and cupric chloride towards bunt, but increases it towards barley smut; it also increases the toxicity of quinolin towards bunt. When equal amounts of copper are present, products with a base of cupric chloride are by far the most effective. With copper oxychlorides and copper carbonates, the physical structure of the mixture has an important effect on fungicidal efficiency.

PETIT (A.). **Moyens individuels et collectifs de défense contre 'Ustilago tritici'.** [Individual and collective means of controlling *Ustilago tritici*.]—*Ann. Serv. bot. Tunis*, xiv–xv (*1937–8*), pp. 43–52, 1939.

In 1936 an epidemic outbreak of wheat loose smut (*Ustilago tritici*) occurred in Tunis and large-scale seed treatment became necessary in order to save the widely grown Florence × Aurore variety, the yield of which in 1938 amounted locally to 1,500,000 quintals. The chief control method adopted was the collective treatment of seed. Such treatment, in continuous operation, is more effective and economical than treatment by individual growers. It consists in two successive immersions in hot water, the first for 45 minutes at 45° C., and the second for 10 minutes at 52°. This method is equally applicable to hard and soft wheat and barley [against *U. hordei*]. Individual growers may use a slight modification of the collective method and immerse the seed for 50 to 60 minutes in water at 48° to 43° (average 45·5°), and then for 10 minutes in water at 52·5° to 51·5° (average 52°). Alternatively, dipping may be carried out once only, the duration being 1¼ to 1½ hours for soft wheat (for which this method is recommended), and 2 to 2½ for hard, the temperature of the water in either case ranging from 48° to 45·5° (average 46·7°).

In one experiment infection of *U. tritici* is stated to have been reduced from 9·6 per cent. in the controls to 2·8 per cent. by heavy dusting (350 gm. per quintal of seed) with 300-mesh white sulphur at an average temperature of 25°, followed by three exposures at intervals of one month to carbon disulphide vapour for 48 hours, the dosage used being 100 gm. per cu. m. of seed.

Oort (A. J. P.). **De verspreiding van de sporen van Tarwestuifbrand 'Ustilago tritici' door de lucht.** [The dissemination of the spores of Wheat loose smut (*Ustilago tritici*) through the air.]—*Tijdschr. PlZiekt.*, xlvi, 1, pp. 1–18, 1 pl., 2 diags., 1940. [English summary.]

A tabulated account is given of the writer's experiments at Sprundel (North Brabant) and Wageningen to determine the part played by aerial dissemination of the spores in the spread of loose smut of wheat (*Ustilago tritici*), the incidence of which in stands raised from seed from approved sources is stated to be frequently unreasonably high. The Sprundel field, 92 by 95 m., situated at a considerable distance from other wheat plantings, was sown in the autumn of 1936 with Juliana winter seed-grain disinfected by the hot-water treatment [*R.A.M.*, xvi, p. 444], with the exception of one plot 10 by 10 m. of heavily infected material designed to serve as inoculum. At an inspection in the following summer the stand grown from the diseased seed-grain showed about 1,350 smutted heads, the remainder of the field being entirely healthy. Samples taken in different directions and at varying distances from the focus of infection were sown separately and the numbers of smutted heads recorded. Part of the Wageningen field was already in use for several loose smut experiments and thus afforded a source of infection: disinfected Vilmorin 27 seed-grain was sown on strips of land on two sides of the field, and the same harvesting procedure followed as at Sprundel.

The resultant data from both tests showed that in all directions except the north-west the dissemination of the spores extended to the edge of the fields. At Sprundel, for instance, there were as many as 11 smutted heads per 100 sq. m. at a distance of 70 m. to the south-east, the corresponding figures for Wageningen at 50 to 90 m. being 1 to 3. A closer analysis of the Sprundel data showed that the spread of the spores in a south-easterly direction was very pronounced and that it diminished regularly with increasing distance from the source of inoculum; in other directions dissemination was weaker and erratic, so that smut islands alternated with disease-free patches. The flowering time of the wheat (with which spore dissemination coincides) lasted from 10th to 18th June, during the first few days of which the light to moderate winds blew from various directions; from the 15th onwards, however, there was a strong north-westerly wind. Strong winds involve horizontal dissemination at the height of the heads, with the result that infection is heavy and decreases with distance; light winds, on the other hand, are accompanied by vertical air currents causing the alternate rising and falling of the spores and producing the general weakness and irregularity of infection observed in the experimental area. Should it be proved that dissemination can take place over even longer distances (1 km. or more), the vertical air currents associated with light winds may assume greater importance than the strong horizontal movements; in the meantime, however, confirmation of the former hypothesis is lacking, while the significance of strong winds in the spread of loose smut has been fully established by the experiments described. Field inspections should be extended to cover adjacent areas for a distance of several hundred metres.

Pissareff (V. E.) & Malinovskaya (Mme E. S.). Селекция яровой Пшеницы на устойчивость к фузариозу. [Selection of spring Wheat for resistance to fusariosis].—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 8, pp. 13–18, 1939.

In an investigation on the cause of the low rate of emergence of spring wheats in the Moscow region, infection with species of *Fusarium* (including several forms from the section *Elegans*, *F. culmorum*, and *F. avenaceum*) was found to be a factor of the greatest importance. Of the species concerned *F. avenaceum* is considered to be the most dangerous. The results of breeding work encourage the hope that the *Fusarium* problem can be controlled by the selection of resistant varieties. High resistance was obtained in hybrid 170 from the cross Local Norwegian × Blue Stem, and hybrid 68 from the cross Milturum 321 × Marquis, both of which gave good yields, the yield percentages for 1938 being 147·6 and 127·8 as compared with 100 for the standard variety Lutescens 062.

Noll (W.). **El pietín del Trigo (Ophiobolus graminis Sacc.) en el Uruguay. Informe preliminar.** [Foot rot of Wheat (*Ophiobolus graminis* Sacc.) in Uruguay. Preliminary note.]—*Arch. fitotec. Uruguay*, iii, 1, pp. 96–101, 4 figs., 1938. [English and German summaries. Received April, 1940.]

Foot rot of wheat (*Ophiobolus graminis*) is stated to cause heavy damage to the crop (25 per cent. reduction in 1938) in Uruguay, where it is favoured by the mild winter climate and failure to observe a correct rotation. Barley is also liable to severe infection, but oats (wild and cultivated) are practically immune, while rye and other Gramineae suffer little or no injury. Early-sown stands are more severely attacked than late-sown, and the fungus thrives in soils with an insufficient proportion of humus. Control measures based on the correction of these cultural errors are indicated [*R.A.M.*, xix, p. 269]. Among the wild Gramineae to be eradicated from cereal fields is *Lolium multiflorum*, which may serve to perpetuate the parasite in the soil.

Petit (A.). **Le soufre contre le charbon couvert de l'Orge.** [Sulphur against covered smut of Barley.]—*Ann. Serv. bot. Tunis*, xiv–xv (*1937–8*), pp. 85–90, 1939.

In experiments carried out in Tunis from 1933 to 1938, inclusive, untreated barley seed heavily infected with *Ustilago hordei* gave, on an average, plants with 12·2 per cent. smutted ears, the corresponding figures after treatment with various forms of sulphur ranging from 0·1 per cent. (for Codex precipitated sulphur and 300-mesh white precipitated sulphur) to 1·5 per cent. for flowers of sulphur. No infection at all resulted when the seed was treated with copper chromate or talc with 5 per cent. of polyoxymethylene, but the former is rather expensive, and the latter unpleasant and poisonous to handle. It is concluded that to control barley smut it is only necessary to treat the seed with some finely divided, adherent form of sulphur or sulphocupric product at the rate of 350 gm. per quintal of seed. Finely triturated sulphur, for instance, is eminently suitable.

THORPE (S. K.). **Black-ended Barley grains.**—*J. Inst. Brew.*, N.S., xxxvii, 2, pp. 34–37, 2 figs., 1940.

Attention is drawn to a defect known as 'black end' of barley grains, occasionally affecting 5 per cent. or more of the home-grown crop and also observed in a few samples of the 1938 Californian harvest, accompanied in the latter case by a sugary, glutinous exudate obviously not attributable to dew condensation (to which the condition is referred in England). W. C. Moore and H. Hunter agreed that the disorder was not due to *Alternaria* or *Helminthosporium sativum*, while perusal by J. A. Burns of the relevant American literature indicates no correlation between 'black end' and 'yellow berry' of wheat and other grains. Possibly the absence from the soil of some mineral constituent concerned in the building-up of the cell wall tissues may be responsible for the failure of the starch cells to retain the newly formed product. In the course of the malting process the sugary attachment is washed off from its place in the middle of the ear and no black-ended grains are discernible, whereas in the English material the blackening, situated at the ear base, passes into the malt. The paper is followed by a discussion.

DANKO (N. V.). Закукливание Овса и причины, его вызывающие. ['Zakooklivanie' of Oats and the factors causing it.]—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 9, p. 34, 1939.

The 'pupation' disease of oats [*R.A.M.*, xix, p. 268] was studied during 1937 in the Tulun selection station in the district east of Lake Baikal. The disease is considered to be due to environmental factors causing injury of the growing point. Oats sown in normally dense rows (at the rate of 180 kg. per hect.) suffered considerably less from the disease than when sown in widely spaced rows (at the rate of 20 kg. per hect.), the percentages of diseased plants of the varieties No. 86/5 and Golden Rain being 14 and 17, respectively, in the former case, and 73 and 78·2, respectively, in the latter. It appears that exposure of the plants to full sunlight, involving a higher rate of evaporation of water from the soil, has an adverse effect upon the growing point; plants which emerged on cloudy days with consequently weak insolation and low evaporation rate and were able to complete their initial growth in similar weather showed normal development. The injury is believed to be inflicted in young plants during the rapid changes of weather so typical for Siberia, when sudden strong sunshine after rain produces high temperatures and rapid evaporation of water from the soil. Oats sown on south slopes in heavy, water-retaining soils were found to suffer severely from the disease. No evidence was obtained that the disease was favoured by early sowing of the oats or that it was transmitted by seed. It is tentatively recommended that oats should not be sown on heavy soils and on south slopes, that rapid growth of the plants should be stimulated by applications of fertilizers, and that more dense sowing be adopted.

MOURASHKINSKY (K. E.). Болезни Озимой Ржи в Омской области [Diseases of winter Rye in the Omsk district].—*Омская Область* [*Omsk District*], *1940*, 1, pp. 53–56, 1940.

Apart from the more common diseases of rye occurring in the Omsk

district, West Siberia, the author mentions damping-off caused by various species of *Fusarium* (*Calonectria graminicola*, cited as the causal agent in other countries, has not been found in the district [cf. *R.A.M.*, viii, p. 771]); a more important root and stem base rot caused in the southern parts by *Helminthosporium* sp. and in the more northern by *F.* spp.; and more rarely *Leptosphaeria herpotrichoides*, pupation disease [see preceding abstract], noticed in several localities in small amounts, and diseases caused by *Colletotrichum graminicola*, *Marssonina graminicola*, and *Septoria graminum*.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1938–39*, Part II, pp. 55–62, 1 fig., 1939.

In studies on maize diseases carried out in Iowa in 1938–9 [cf. *R.A.M.*, xviii, p. 243] I. E. Melhus and G. Semeniuk determined the reactions of more than 90 maize varieties to *Ustilago zeae* by field trials. Wide differences between inbred lines and between single crosses were evident, and the limited data obtained indicated that transmission of resistance and susceptibility is unpredictable.

Further investigation by I. E. Melhus into the inhibitor formed by *Diplodia zeae* showed that it is not adsorbed by talc, charcoal, or celite. The nature of the nitrogen source appeared to influence the production of the inhibitor, inhibition occurring much earlier on media containing nitrate as the source of nitrogen than on those containing ammonium salts or asparagin; no inhibition was observed when the fungus was grown for 119 days with leucine as the source of nitrogen.

C. S. Reddy summarizes the results of studies on the effects of cob maturity on resistance in dent maize to *Basisporium gallarum* [*Nigrospora* sp.]. If the secondary ear is about as large as the primary it will not, as a rule, be diseased, but the percentage of infection of secondary ears increases as the ratio of the weight of the secondary ears to the primary decreases; at ratios less than 3 to 10, infection was 80 and 2 per cent. in the secondary and primary ears, respectively. Investigation into the effect of root infection in preventing normal maturity of the cob tissues showed that ten inbred lines resistant to *Nigrospora* had an average pulling test of 137½ lb., while 10 inbred lines with much infection in the ears had a mean pulling test of 76·1 lb. The presence of *Nigrospora* in arrested ear shoots was shown to be one of the chief means of overwintering of the fungus, even in years when ear infection is uncommon.

In greenhouse studies by G. Semeniuk, C. S. Reddy, I. E. Melhus, W. E. Loomis, E. W. Lindstrom, and A. A. Bryan the antibiotic activity of other soil micro-organisms towards *D. zeae* was an important factor in reducing seedling infection. This effect was not, however, appreciably expressed on seed naturally infected with *D. zeae*.

In notes on the plant disease survey of Iowa I. E. Melhus, C. S. Reddy, and R. H. Porter state that in 1938 crown rust (*Puccinia coronata*) of oats reached epidemic proportions in Iowa, causing an estimated loss of yield of 24 per cent. *P. rubigo-vera* var. *tritici* [*P. triticina*] caused an estimated loss in winter wheat of 28 per cent. *Basisporium* dry rot of maize [*N.* sp.] was severe in isolated fields, and some of the hybrid seed, especially that having Osterland 420 or Iodent

205 as a parent, appeared to show much more infection than other hybrid seed stocks. In one field of 939 hybrid seed, 20 per cent. of the ears were infected. Anthracnose (*Gnomonia ulmea*) of Chinese elm occurred in epidemic form on seedlings and more mature trees [ibid., xviii, p. 375].

McNew (G. L.). **Factors influencing attenuation of Phytomonas stewarti cultures.**—*J. Bact.*, xxxix, 2, pp. 171–186, 2 graphs, 1940.

Highly virulent cultures of *Phytomonas* [*Aplanobacter*] *stewarti* from maize were observed in the writer's experiments at the Rockefeller Institute for Medical Research [*R.A.M.*, xix, p. 208] to lose their virulence by a series of steps, the first change being the appearance of a variant of mediocre pathogenicity which became predominant but did not as a rule completely replace the virulent parent type. Eventually, slightly virulent strains (causing only 30 to 50 per cent. infection on Golden Bantam leaves compared with up to 100 for the highly pathogenic) developed and in some cases became dominant. Cultures grown on synthetic agar, in synthetic broth, or in potato-dextrose broth lost much of their virulence after 31 transfers. Such cultures contained scarcely any of the highly pathogenic type of cell and very few of the intermediate. On the other hand, cultures maintained on nutrient dextrose agar, in broth of the same composition, or peptone, were fully virulent at the end of the same period despite the presence of some feebly pathogenic strains. Nutrient dextrose broth cultures incubated at 16° and 26° C. contained the same types of strains in approximately identical proportions, whereas at 36° a considerable attenuation was observed, the weakly virulent strains preponderating and the actively pathogenic being virtually absent. Regular transfers to fresh broth retarded the loss of virulence to some extent. The virulent parent type became extinct between the 34th and 43rd day of culture.

Parker (E. R.), Southwick (R. W.), & Chapman (H. D.). **Response of Citrus trees to manganese applications. A preliminary report.**—*Calif. Citrogr.*, xxv, 3, pp. 74, 86–87, 1 fig., 1940.

In this progress report on studies carried out in southern California on manganese deficiency in citrus trees [*R.A.M.*, xix, p. 143], the authors state that in 1937 young lemon trees in Ventura county produced basically light green leaves with dark green veins; in some leaves the dark green areas about the veins expanded but failed to fill the leaf, such leaves being distributed in all parts of the tree, and being less dwarfed than similar leaves on trees affected with mottle leaf. Some normal leaves were present.

In August, 1939, affected lemons in two localities were treated by applications of manganese chloride (*a*) by insertion of crystals (3 to 8 gm. per 2 in. limb), (*b*) by injection of solution (1 gal. water containing 15 gm. of the salt), and (*c*) by spraying with solution (50 and 100 gm. per gal., the higher concentration also being used with 75 gm. of soda ash [sodium carbonate] per gal.). All the treatments were made on three sets of trees showing symptoms of different severity. A fortnight later, the more severely affected limbs showed definite improvement from all the treatments given. The sprays made without sodium

carbonate caused some burning. By 9th October, the leaves on the treated trees were almost entirely free from mottle, though those on the untreated limbs still showed definite symptoms.

Affected lemon and orange trees were sprayed with manganese sulphate at three concentrations (0·5, 1·0, and 3·0 lb. metallic manganese per 100 gals.) with the addition of hydrated lime or sodium carbonate. Three grades of manganese sulphate were used: one pure, expensive grade of the anhydrous salt and two more economical materials containing 65 or 80 per cent. manganese sulphate. The lowest-grade material sometimes contained ingredients objectionable in spraying. The two higher concentrations gave earlier responses than the lowest which did, however, induce definite improvement. So far, small plots have been treated in about 60 orchards, and all the trees showing leaf symptoms have improved as a result of the treatments, though the untreated trees still show definite symptoms. On the evidence so far available it is recommended that experimental applications should be made with a spray consisting of 10 lb. manganese sulphate (65 to 80 per cent. pure, spraying grade), 5 lb. sodium carbonate, and 100 gals. water. The best time of year to make the treatment is not yet known.

Bates (G. R.). **Growth behaviour of plants following seed treatment by organic mercury compounds.**—*Nature, Lond.*, cxlv, 3668, pp. 262–263, 1940.

The author suggests that in the light of Kostoff's recent paper [*R.A.M.*, xix, p. 269] the control of citrus albinism by organic mercurials as reported by Perlberger and Reichert [ibid., xviii, p. 247] may possibly be due to the effect of the seed treatment on mitosis.

Bitancourt (A. A.) & Jenkins (Anna E.). **Ciclo evolutivo de 'Elsinoë australis Bitancourt & Jenkins', agente da verrugose da Laranja Doce.** [The life-history of *Elsinoe australis*, the agent of Sweet Orange scab.]—*Arq. Inst. biol. S. Paulo*, x, pp. 129–146, 9 pl., 1939. [English summary.]

This comprehensive study of the life-history of *Elsinoe australis*, the agent of scab of sweet orange and other citrus fruits in South America [see below, p. 341], is stated to be based mainly on an examination of the type specimen [*R.A.M.*, xvi, p. 95], supplemented by the only other example of the perfect stage hitherto discovered (also from Brazil). The other countries in which the disease occurs are the Argentine, Uruguay, and Paraguay.

Monospore cultures from ascospores of the type specimen were germinated in water and on the surface of potato dextrose agar. In water the ascospores rapidly gave rise to conidia, germinating by means of germ-tubes, the length of which, after 24 hours, sometimes exceeds 20 times that of the conidia. As a rule, the conidia separated rapidly from the ascospores in the water cultures, but in one instance, in which evaporation reduced the amount of water to a film surrounding the ascospores, the conidia remained attached to the latter and germinated *in situ*. On the agar medium germination took place by means of germ-tubes arising from each cell of the ascospore, which quickly branched out into a spherical thallus with setose hyphae extending from the surface. Sections of acervuli and underlying tissue gave rise

in 24 hours in a drop of potato dextrose agar to new hyphae, which were absent from the tissues within the phellem and the phellem itself. The further development of the thalli from these cultures was essentially identical with that from the ascospores.

Further proof of the genetic connexion between the two stages was secured between 1936 and 1938 by field inoculations on three sweet orange varieties, Abacaxi, 'pear', and 'lime', and a variety of tangerine orange, in which the percentages of positive results obtained with the ascospore and conidial cultures were 77 and 79 per cent., respectively. The experimental injuries resulting from these artificial inoculations produced the characteristic fructifications of the imperfect stage, and revealed an anatomical structure conforming to that observed in natural lesions.

Two cultures from the type specimen, a single ascospore culture, a culture from a microsection of an acervulus, and a reisolation culture were compared on potato dextrose agar with eleven earlier isolates of the fungus, including saltations of each of the three groups already described as (1) viscous, (2) black, and (3) velvety; the three new cultures were all found to belong to group (2). A growth type represented by three isolates of 1935 was designated as group (4) reddish.

STAHEL (G.). **Corticium areolatum, the cause of the areolate leaf spot of Citrus.**—*Phytopathology*, xxx, 2, pp. 119–130, 7 figs., 1940.

Areolate leaf spot of citrus, which is stated to be prevalent in Dutch Guiana, where sour oranges were severely affected 20 years ago during the heavy rains, was attributed by Bondar in 1929 to *Leptosphaeria citricola*, and by Bitancourt and Jenkins in 1935 to *L. bondari* [*R.A.M.* xv, p. 90]. The author's studies on the fungus in question showed the mycelium to be quite distinct from that of *L. bondari*, which is a common saprophyte.

The light brown spots produced by the pathogen on the leaves of susceptible fruits, such as sour orange, grapefruit, pomelo, and mandarin, are enlarged each morning by one new water-soaked ring, 1 mm. in width, which during the day turns brown and collapses, impregnating the contiguous tissue with yellowish gum. At night, under humid conditions, this gummed barrier is passed by the fungus and a new ring added. The rings of gummed cells do not collapse but form the concentric, dark brown ridges typical of the disease. Usually the rings number 10 to 20 per lesion, but up to 47 have been counted on the branched spots sometimes formed by the passage of the organism through breaches left in the barrier after its closure with the advent of dry weather. Some of the primary necrotic spots, ½ to 1 mm. in diameter, do not expand at all under dry conditions, while others do so asymmetrically. The lower leaf surfaces are frequently covered in wet weather with a whitish mildew consisting of the mycelium of the fungus, which grows from the fallen foliage into the soil, where it probably persists through the dry season in the form of sclerotia (though these have only been observed in culture). Primary spots, which do not expand, have been observed on young, green twigs, but not (in the author's experience) on the fruits. The small black points on the oldest parts of the spots are the perithecia of *L. bondari*.

The causal organism of the areolate leaf spot, *Corticium areolatum* n. sp. [with a Latin diagnosis], is readily isolated on Sabouraud's agar, whence it may be transferred to other media, e.g., sterilized potato slices, on which sclerotia were formed most abundantly. These organs are dark brown, flat, 1 mm. in diameter, and consist of clumps of swollen hyphae without a cortex. The epiphyllous mycelium is composed of straight, light brown hyphae, with hyaline lateral branches of swollen cells bearing basidia, 10 to 14 by 8 to 10 μ, with four (rarely two) sterigmata, 10 to 13 μ long and 3 to 3·5 μ thick at the base, producing smooth, hyaline, papillate spores, 8 to 9 by 5 μ, which germinate in water and on agar within 12 hours. The germ-tubes grow very slowly and form irregular swellings, developing after four to five days into sclerotia, which in turn give rise to the mycelium. In inoculations on young grapefruit leaves the basidiospores germinate immediately, producing a minute appressorium and penetrating the cuticle. The resultant germ-tube grows as a flat hypha for a short distance between the cuticle and epidermal cells, before entering the deeper tissues. In the mesophyll just below the site of spore germination a sclerotium develops and kills the tissue as the leaf approaches maturity. The hyphae radiate into the dead tissue and the primary spot thus formed grows out into an 'areolate' (more correctly 'aureolate', but the accepted orthography is retained to avoid confusion) lesion as described above. No true hymenium is formed, the basidia being scattered over the side branches of the fertile mycelium covering the substratum like a cobweb. Inoculations with the mycelium and sclerotia were also successful. The disease may be effectively controlled by collecting and burning the fallen leaves; spraying with Bordeaux mixture, and in wet weather spraying the soil and, if necessary, affected leaves, especially on the under side, are beneficial.

Fawcett (G. L.). **Observaciones sobre algunas de las enfermedades presentes en los Cítricos de Tucumán.** [Observations on some of the diseases affecting Citrus trees in Tucumán.]—*Rev. industr. agric. Tucumán*, xxix, 7–9, pp. 176–178, 1939.

This is a popular account of the more important diseases of citrus trees in Tucumán (Argentine) [cf. *R.A.M.*, x, p. 24], viz., gummosis (*Phytophthora citrophthora* and *P. parasitica*), anthracnose (*Colletotrichum gloeosporioides*) [ibid., xv, p. 14], *Septoria citri*, psorosis [ibid., xv, p. 13], sour orange scab (*Sphaceloma* [*Elsinoe*] *fawcetti*), sweet orange scab [*E. australis*: see above, p. 339], melanosis (*Diaporthe citri*) [ibid., xviii, p. 238], exanthema, and chlorotic disorders of various types, with directions for their control.

Pfältzer (A.). **Topsterfte-bestrijding speciaal in verband met rejuvenatie.** [Top die-back control, especially in connexion with rejuvenation.]—*Bergcultures*, xiv, 7, pp. 228–229, 1940.

Practical directions are given for the radical control of top die-back of coffee [*Rhizoctonia* sp.: *R.A.M.*, xviii, p. 729] in Java, with special reference to the provision of sound stocks for the scions in the grafting operations incidental to the establishment of new plantings, and to the

protection of the fresh growth from direct infection. It is pointed out that the work of 'rejuvenation' affords a favourable opportunity for drastic intervention in the matter of top die-back, since the necessary loss of branches and fruit-bearing wood entailed by severe pruning is of little economic importance at this stage in the life of the plantation.

CARNEIRO (J. G.) & PICKEL (D. B.). **Catálogo das bacterias e dos fungos do Caféeiro.** [A list of the bacteria and fungi of Coffee.]—184 pp., S. Paulo, Secretaria da Agricultura, 1940.

This is an annotated list, supplemented by bibliographical references, of the bacterial and fungal diseases affecting coffee in South and Central America and the other countries in which the crop is grown [cf. *R.A.M.*, xv, p. 717].

HANSFORD (C. G.). **Vascular diseases of Cotton in Uganda.**—*E. Afr. agric. J.*, v, 4, pp. 279–282, 1940.

Vascular diseases of cotton, caused by *Verticillium dahliae* and strains of the *Elegans* section of *Fusarium* [*R.A.M.*, xviii, pp. 574, 575], and termed by the author the 'cotton wilt complex', have become increasingly prevalent in Uganda during the past ten years. Cross-inoculation studies indicate that the individual strains of *F.* found on the Kampala plantation are able to infect a number of different crops, though only certain individuals are susceptible in each. Inoculation tests with *V. dahliae* produced instances of wilt on every variety of every crop tested. At present, laboratory investigations in Uganda are directed at isolating as many wilt organisms as possible, and testing each on a wide range of local crops and common weeds; in this way it is hoped to ascertain what rotations are safe with cotton.

The cotton varieties grown in Uganda are very heterogeneous, and attempts are in progress to select resistant strains [cf. ibid., xix, p. 14]. So far, no immune or highly resistant variety has been found, but there are marked differences in susceptibility, B.P. 50 being more susceptible than the standard Buganda Local variety, and B. 181 less susceptible than either. Experimental evidence demonstrated that resistance is modified by soil or climatic conditions, cotton grown on land heavily dosed with infected material every year showing little or no increase in wilt incidence, while in other parts of the same plantation incidence became annually progressively higher. Experiments by J. D. Jameson at Bukalasa showed that percentage incidence was less when the space between crops was reduced, and that when a widely spaced crop was interplanted with groundnuts or beans, wilt was reduced. This result would appear to indicate that at Bukalasa, where soil temperatures range from 76° to 80° F., shading of the ground reduces liability to wilt; in the Eastern Province of Uganda, where the soil temperatures are higher, wilt prevalence tends to be greater under shade. In central Uganda, incidence has risen steadily in certain areas, probably as a result of the distribution of infected soil and infected seed. In single plots spread occurs progressively, though not uniformly, from the original infection centres. The disease has not, however, so far caused important damage to the crop as a whole.

Cumley (R. W.) & Goldsmith (G. W.). **Preliminary serological studies of Phymatotrichum omnivorum.**—*Phytopathology*, xxx, 2, pp. 130–139, 1940.

In order to determine the systematic affinities of the cotton root rot fungus, *Phymatotrichum omnivorum*, a preliminary serological study was undertaken at the University of Texas, involving two methods of securing material. In the first, young sporophores of *Tyromyces palustris*, *Psalliota sylvatica*, *Clitocybe illudens*, *Lycoperdon gemmatum*, *Calvatia cyathiformis*, *Secotium acuminatum*, and *Ustilago maydis* [*U. zeae*] were collected in the field, washed, dried over sulphuric acid at 50° C., and stored in glass jars at 5°. In the second, pure cultures of *Rhizopus nigricans*, *Aspergillus niger*, *Penicillium luteum*, *Hormodendrum cladosporioides* [*R.A.M.*, xvii, p. 114], *Fusarium* sp. of the *Elegans* section, *Sclerotium rolfsii*, and *Phymatotrichum omnivorum* were grown in a liquid nutrient (non-protein) medium, removed when sufficiently developed, washed, dried in an incubator at 40° to 45°, and stored at 5°. The results [which are discussed and tabulated] of precipitin and complement fixation tests with rabbit sera prepared against *P. omnivorum* indicated a closer relationship between *P. omnivorum* and the puffballs, *L. gemmatum*, *Secotium acuminatum*, and *C. cyathiformis* than with any of the other genera, thereby supporting Presley and Thom's conjecture as to the taxonomic position of the root rot pathogen among the Gasteromycetes [ibid., xvi, p. 606].

Attimonelli (R.). **Reperto di blastocisti nelle Mosche.** [Detection of blastocysts in Flies.]—*Pathologica*, xxxii, 580, pp. 59–61, 1940. [German and English summaries.]

At the Bari (Italy) Institute of Hygiene and Bacteriology the writer detected the presence of *Blastocystis hominis* [*R.A.M.*, xix, p. 277] in the digestive tract of 1·6 per cent. of the flies (*Musca domestica*) examined [ibid., xii, p. 508]. The normal features of the pathogen, however, were so much altered as to suggest that their habitat was a very inappropriate one for conservation and development.

Evlakhova (Mme A. A.). Новый дрожжеподобный грибок **(Blastodendrion pseudococci nov. sp.),** патогенный для мучнистых червецов. [A new yeast-like fungus (*Blastodendrion pseudococci* nov. sp.) pathogenic to Mealy Bugs].—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 79–84, 3 figs., 1939.

A new fungus, *Blastodendrion pseudococci*, was isolated from mealy bugs (*Pseudococcus citri*), which died when exposed to conditions of excessive humidity in the laboratory, and its pathogenicity proved, several artificial infection experiments giving 50 to 100 per cent. killing. The growth of the fungus on culture media and some of its morphological and physiological characters are described but no diagnosis is given.

Henrici (A. T.). **Characteristics of fungous diseases.**—*J. Bact.*, xxxix, 2, pp. 113–138, 6 figs., 1 diag., 1 graph, 1940.

In this presidential address to the Society of American Bacteriologists on 29th December, 1939, the view is advanced that the outstanding characteristic of the human mycoses is their strong tendency to give

rise to a particular type of hypersensitivity (allergy), upon which the other features of the diseases, such as age, occupational incidence, course, and pathology, are largely dependent. This characteristic differentiates the mycoses from most maladies of the microbic group, but closely relates them to tuberculosis and (in some aspects) to leprosy and other diseases. The striking divergences in respect of distribution, growth habit, and other characters between deep-seated and superficial mycoses should not obscure their fundamental affinity.

MACKINNON (J. E.). **Dissociation in Candida albicans.**—*J. infect. Dis.*, lxvi, 1, pp. 59–77, 9 figs., 1940.

In his studies at the Institute of Experimental Hygiene, Montevideo, Uruguay, the writer has observed two types of spontaneous variation in pure cultures of *Candida albicans* (strain 582, isolated from a case of paronychia, and others), designated membranous and lethal [*R.A.M.*, xix, p. 278]. Variation in the membranous direction is characterized by the elongation of the blastospores into pseudohyphae, accompanied by gradual modifications in the macroscopic appearance of the colonies on Sabouraud's glucose agar, which are enveloped by a filamentous halo and become successively rugose, opaque, and finally, in extreme cases, spiky and hard. In a liquid medium the development of the membranous form coincided with a diminution in virulence. Partial reversion from the membranous to the normal creamy form has been observed, but the reverted variants are unstable and tend to develop once more into the membranous condition.

Lethal variation involves a reduction in the rate of growth and great diminution or total loss of virulence. Both types of variation may occur in the same strain, giving rise to forms combining lethal and membranous characters, or a strain that has varied in the lethal direction may later assume the membranous form, and vice versa.

The membranous variant of *C. albicans* described by the author in 1936 (*Arch. Soc. Biol. Montevideo*, vii, p. 162) is considered to be homologous with those observed by a number of workers in true and non-pathogenic red yeasts, and identical with the R form of Besta (1938) [*R.A.M.*, xvii, p. 676] and Cavallero (1939) [ibid., xviii, p. 394]. On the other hand, Negroni's R form (*R. Soc. argent. Biol.*, xi, p. 449, 1935) is identical with the writer's lethal variant. As in the red yeasts, variation of the types described in *C. albicans* is accompanied by modifications of pigmentation, which may be used as an additional criterion.

It is apparent from these data that *C. albicans* is capable of producing a theoretically infinite number of possible combinations, a fact that readily accounts for the existing confusion in its nomenclature. The methodical study of hereditary variations in pathogenic fungi is considered to be of outstanding importance in their identification and classification.

DOWNING (J. G.), MERRILL (BEULAH), & BELDING (D. L.). **A clinical and laboratory study of the incidence of fungi in patients with cutaneous eruptions.**—*New Engl. J. Med.*, cxxii, 7, pp. 263–266, 1940.

During the period from July, 1938, to July, 1939, 179 (37·6 per cent.)

of the patients with cutaneous eruptions at the Boston City Hospital yielded positive evidence of fungal infection either by direct examination (73·7 per cent.) or by culture (78·7), the former method having been found preferable in the cases of *Microsporon*, *Trichophyton*, *Epidermophyton*, and *Malassezia*, and the latter in those of *Monilia* [*Candida*], *Cryptococcus*, and *Mycoderma*. The 60 positive cultures of *Microsporon* consisted of 17 *M. audouini*, one *M. gypseum*, and 42 *M. lanosum*, while *Trichophyton* was represented by *T. gypseum* (10), *T. purpureum* (6), and unclassified (8). *E. floccosum* occurred in three patients, while 24 of the 37 cultures of *Candida* were identified as *C. albicans*. Undetermined species of *Cryptococcus*, *Mycoderma*, and *Malassezia* were detected in 11, 7, and 11 cases, respectively.

Grigoraki (L.) & David (R.). **Caractères bio-chimiques de Trichophyton radians (Sabouraud, 1909).** [Biochemical characters of *Trichophyton radians* (Sabouraud, 1909).]—*C.R. Soc. Biol., Paris*, cxxxiii, 2, pp. 234–236, 1940.

Continuing their studies on the biochemical characters of the dermatophytes [*R.A.M.*, xix, p. 279], the writers found that *Trichophyton radians* [ibid., xv, p. 218] peptonizes milk in 40 days, liquefies gelatine slowly, and produces the most characteristic changes in the colour of carbohydrate solutions after ten days. These characters are quite distinct from those of *T. asteroides* [*T. mentagrophytes*: ibid., xix, p. 216] and *T. lacticolor* [ibid., xviii, p. 678], which have been placed in the same clinical group, and tend to confirm the botanical differentiation of the species.

Gougerot (H.) & Duché (J.). **Epidermite due au Sporotrichum gougeroti.** [Epidermal inflammation due to *Sporotrichum gougeroti*.]—*Bull. Soc. franç. Derm. Syph.*, xlvi, 8, p. 1455, 1939.

To the 19 cases of sporotrichosis caused by *Sporotrichum gougeroti* cited in *Nouv. Prat. derm.*, ii, p. 498, 1936, may now be added a further two, one observed by the authors in a 49-year-old commercial traveller suffering from interdigital eczema, and the other by Rabello in Brazil [*R.A.M.*, xviii, p. 595].

Felderman (L.). **Infection with Aspergillus niger: report of two cases.**—*Arch. Otolaryng., Chicago*, xxxi, 2, pp. 327–331, 1 fig., 1940.

Clinical details are given of two cases of aspergillosis of the upper air passages, both in women, treated by the author at Philadelphia and referred on the basis of cultural studies to *Aspergillus niger* [*R.A.M.*, xix, p. 218].

Blaich (W.). **Beitrag zur Kenntnis der Pityriasis versicolor.** [A contribution to the knowledge of pityriasis versicolor.]—*Derm. Wschr.*, cx, 4, pp. 65–70, 4 figs., 1940.

Two atypical cases of pityriasis versicolor treated by the writer at the Münster (Westphalia) Dermatological Clinic are described, one in a 17-year-old domestic servant and the other in a soldier. The symptoms in the former patient were of the lichenoid type, presumably representing the initial stages of the disorder, while in the latter both the 'white'

and 'black' forms of pityriasis were observed. *Malassezia furfur* [*R.A.M.*, xix, p. 94] developed in a very abnormal and irregular manner on urine-agar (1 : 10) cultures from the first patient, but all attempts to isolate the fungus from the second gave negative results. These data further exemplify the well-known difficulty of culturing *M. furfur* [see next abstract].

MOORE (M.). **Malassezia furfur, the cause of tinea versicolor : cultivation of the organism and experimental production of the disease.**—*Arch. Derm. Syph., Chicago*, xli, 2, pp. 253–260, 4 figs., 1940.

The writer has already reported his success, after considerable difficulty, in the culture of *Malassezia furfur* from pityriasis versicolor lesions [*R.A.M.*, xvii, p. 678 and preceding abstract], and here reviews the characteristics of the organism in the tissues and in culture and gives further data on the experimental inoculation of the fungus into laboratory animals, human volunteers, and the chorioallantoic membrane of the developing chick [ibid., xviii, p. 738].

In young lesions the fungus, which was isolated from nine patients at the Barnard Free Skin and Cancer Hospital, St. Louis, Missouri, appears as a filamentous, branching mycelium, 1·5 to 2 μ in diameter; in older ones cross walls and short hyphal cells are formed, 1·5 to 4 μ in diameter and 10 to 16 μ in length, which in turn develop into spherical, free, arthrosporous cells, 3 to 8 μ in diameter. The colonies of the organism produced at 37° C. on artificial media, of which 1 per cent. peptone and 4 per cent. maltose was the most satisfactory, are flat, dull or moist, mucoid, shiny, verrucose, cerebriform or rugose, vermiculate, and of a velvety consistency; an arborescent habit is specially characteristic of wort agar cultures. The colour varies on different substrata from whitish-grey and fawn to creamy buff and light cinnamon in young cultures to ochraceous buff and dark cinnamon in older ones. The thick-walled, spherical, ovoid, or ellipsoid arthrosporous cells budded off from the hyphae measure 4 to 10 μ in diameter. Chains of thick-walled, sclerotic cells, with fine, non-septate, dendritic, and intertwining hyphae, are also formed. *M. furfur* liquefies gelatine, acidifies litmus milk, and evolves acid but no gas from dextrose, d-oxylose, amygdalin, and d-levulose.

Experimental inoculations on laboratory animals by the percutaneous method or application of the fungus to the intact skin gave negative results. Intracutaneous injections into rabbits and guinea-pigs resulted in granulomatous lesions. Three out of eight human volunteers responded positively to skin inoculations, while the transplantation of the organism to the chorioallantoic membrane of a developing chick induced a reaction in the layers of this structure, with a reversion of the cells to the morphological pattern typical of scrapings from human lesions.

PALO (M. A.) & CALINISAN (M. R.). **The bacterial wilt of the Abacá (Manila Hemp) plant in Davao. I. Nature of the disease and pathogenicity tests.**—*Philipp. J. Agric.*, x, 4, pp. 373–395, 15 pl. (1 col.), 1939.

The most serious disease of abacá in the Davao and Cotabato Provinces of the Philippines is stated to be the one previously reported

as vascular disease or wilt [*R.A.M.*, xviii, p. 256]. A survey in Davao (covering only about one-fourth of the total abacá-growing area) during May, 1937, to December, 1938, showed a total of 1,301·5 hect. affected by the disease; of these, 1,059 hect. have now been eradicated and partly replanted with the resistant Tañgoñgon variety. The most striking external symptoms of the disease are rust-brown linear streaks along the veins on some or all leaves, followed by a yellowing of the tissues along the veins and ultimately a browning and wilting. In cases of acute infection plants wilt rapidly without showing linear streaks. Other external symptoms are a conspicuous retardation of growth of the central leaf; narrowing of the leaves (most common in the Lauan-Tañgoñgon variety); and the appearance of large blackish-brown patches of rotting tissue at the base of the pseudostem. An examination of sections of the rhizome and pseudostem showed that the vascular strands of affected plants are discoloured, the spread of the infection being easily traced up to the petioles and midribs and out into the leaf veins. Weevil borers, such as *Cosmopolites sordidus* and *Odoiporus paganus*, sometimes found in affected plants are considered of minor importance as causal agents, although their attacks weaken the plants and predispose these to infection. Large numbers of actively motile bacteria were always found in the rusty-brown linear streaks on the leaves and the discoloured vascular strands of the petioles, midribs, and leaf sheaths, but none were observed in the deeply stained strands of the pseudostem and rhizome in advanced stages of infection, the reason for this being still unknown. *Fusarium* mycelium was, on the other hand, occasionally found in the deeply stained strands of the rhizome and pseudostem, but never in the infected veins of the leaves. The causal bacterium was isolated with much difficulty, as it was often outgrown by other faster-growing, probably secondary, organisms. The colonies of the pathogenic bacterium formed after three to four days resembled those of *Bacterium solanacearum*; they were white, wet, shining, and showed a tendency to flow. This bacterium was more easily isolated from fresh material in the early stages of infection, but never from tissues from advanced stages. Inoculations of Maguindanao plants by either needle pricks or hypodermic injection into the midribs of the heart leaves and pseudostem gave positive results, whereas hypodermic injection into the corm was unsuccessful. The response of the inoculated plants to the wilt organism was very irregular with respect to the time required to contract the disease and the amount of symptoms shown. The organism was reisolated from some of the successfully inoculated plants.

MATSUMOTO (T.). **Need of reinvestigation on the use of Trichoderma as a means of biological control.**—*J. Soc. trop. Agric. Taiwan*, xi, 4, pp. 322–326, 2 figs., 1939. [Japanese, with English summary.]

Root rot of roses, *Croton* spp., and other ornamentals, due to a species of *Trichoderma*, allied to *T. koningi* [*T. viride*: *R.A.M.*, xviii, p. 761] has been observed for several years in Taihoku, Formosa [ibid., xviii, p. 413]. The aerial symptoms of the disease include cessation of growth and loss or pale greenish discoloration of the foliage, generally followed by the premature death of the plants. The roots are covered with a

dense, white mycelium. The results of inoculation experiments indicated that the fungus is rather a weak parasite, attacking plants weakened by transplanting or some other cause. In culture the fungus parasitized the hyphae of *Hypochnus* [*Corticium*] *sasakii* [ibid., xviii, p. 617] and inhibited their growth in exactly the same manner as described by Weindling for *T. lignorum* [*T. viride*] on *Rhizoctonia* [*C.*] *solani* [ibid., xiv, p. 188]. When a leaf of *Eichhornia crassipes* was simultaneously inoculated with *C. sasakii* and the garden *Trichoderma*, little or no infection by the former takes place, whereas in the absence of the soil organism invasion by the *Corticium* is extensive. A reinvestigation of the practice of combating soil pathogens by means of *Trichoderma* is considered in the light of these data to be strongly indicated.

Lyle (E. W.). **Rose diseases.**—*Circ. Tex. agric. Exp. Sta.* 87, 16 pp., 7 figs., 1940.

Popular notes are given on the symptoms, cause, and control of the chief diseases of roses in Texas, viz., black spot (*Diplocarpon rosae*), powdery mildew (*Sphaerotheca pannosa* var. *rosae*), die-back (associated with various fungi, particularly a species of *Diplodia*), crown gall (*Phytomonas* [*Bacterium*] *tumefaciens* and *P.* [*Bact.*] *rhizogenes*), root rot (*Phymatotrichum omnivorum*), *Cercospora* leaf spot (*Mycosphaerella rosicola* [the ascigerous stage of *C. rosicola*: *R.A.M.*, xvii, p. 753]), rust (*Phragmidium* spp.), mosaic, streak, and stem canker (*Coniothyrium fuckelii*). Of these, the first five are of the greatest economic importance locally.

When rose roots have become partly decayed owing to infection by *Phymatotrichum omnivorum*, the whole top turns yellow, suddenly wilts, and may rapidly die. The disease is particularly destructive in wet seasons, and is more prevalent and injurious in neutral to alkaline than in acid soils. The disease, almost unknown in eastern Texas, is of considerable importance in the central and western parts of the State, where, after the removal of rose bushes killed by it, the fungus may survive in the ground for years. As roses are less susceptible to infection than some other plants, and as they bloom quickly under Texas conditions, they can be grown, even in the presence of the disease, if they are replaced every few years. They should be planted in small groups, separated by lawns, not in continuous rows.

Leaf spot due to *M. rosicola* is often confused with black spot (*Diplocarpon rosae*), but in the former disease the spots are smaller, the margins fringeless, and the centres brown or a lighter colour than in black spot; also, defoliation is less marked than is the case with *D. rosae*. Locally, the disease is quite common, especially on understocks of Multiflora varieties, but it is rarely serious enough to require control measures.

Krelage (H.). **Het onderzoek der Hyacinthenziekten. Een episode uit het prae-phytopathologische tijdvak.** [The investigation of Hyacinth diseases. An episode from the pre-phytopathological era.]—*Tijdschr. PlZiekt.*, xlvi, 1, pp. 30–45, 1940.

Extracts are presented from the correspondence between J. H.

Krelage (1824–1901), H. de Vries (1848–1935), and J. H. Wakker (1859–1927) concerning the investigation and control of hyacinth diseases in Holland, showing what intensive study and unremitting efforts were necessary over a period of many years to place this important adjunct of the bulb-growing industry on a sound scientific and financial basis before the introduction of modern phytopathological facilities.

Brierley (P.) & Doolittle (S. P.). **Some effects of strains of Cucumber virus 1 in Lily and Tulip.**—*Phytopathology*, xxx, 2, pp. 171–174, 2 figs., 1940.

This note records the results of the authors' cross-inoculation studies at the United States Horticultural Station, Beltsville, Maryland, with viruses of the tulip and cucumber virus 1 groups [cf. *R.A.M.*, xviii, p. 317] for which there is no evidence of a close relationship.

Strains of cucumber virus were not found occurring naturally in tulips or alone in commercial Easter lilies (*Lilium longiflorum*). When such strains were experimentally introduced into seedling Easter lilies they did not induce symptoms, with the exception of one virulent strain which caused 'yellow top' rather than 'fleck' symptoms. A suggested explanation of the discrepancy between these results and those of Price [ibid., xvi, p. 615] is that some of Price's experimental plants were carrying the latent lily virus of McWhorter [ibid., xvii, p. 41] (a tulip virus commonly present in symptomless Easter lilies), and that the fleck symptoms are a response to double infection.

Cucumber mosaic strains, experimentally introduced into tulips, produced no recognized effects in the current season but induced flower breaks in the following year, as do the tulip viruses. On the other hand, tulip viruses from lily and tulips induce symptoms in *L. formosanum* in two weeks.

Dell' Angelo (G. G.). **Malattie crittogamiche del Garofano. Heteropatella valtellinensis (Trav.) Wr (H. dianthi Buddin et Wakef.; Pseudodiscosia dianthi Hösterm. et Laub.).** [Fungal diseases of the Carnation. *Heteropatella valtellinensis* (Trav.) Wr (*H. dianthi* Buddin & Wakef.; *Pseudodiscosia dianthi* Hösterm. & Laub.).]—*Costa azzur. agric.-flor.*, xix, 11–12, pp. 184–188, 2 figs., 1939.

Notes are given on the history, geographical distribution, economic importance, causal organism, symptoms, and control of carnation leaf rot (*Heteropatella valtellinensis*) [*R.A.M.*, xv, p. 468]. In Italy the disease was observed in 1930 on the Stacchini variety at San Remo, in 1935 on material from Rimini, and in 1936 on carnations from Pescia. In no instance was infection serious, and it is not considered probable that the disease will become a problem in Italy, where carnations are grown out-of-doors.

Dell' Angelo (G. G.). **Malattie crittogamiche del Garofano: Alternaria dianthi Stev. e Hall.** [Fungal diseases of the Carnation: *Alternaria dianthi* Stev. & Hall.]—*Costa azzur. agric.-flor.*, xx, 1–2, pp. 14–18, 1 fig., 1940.

A brief, popular account is given of the history, geographical

distribution, economic importance, symptoms, cause, and control of carnation blight (*Alternaria dianthi*) [*R.A.M.*, xvi, p. 659]. The disease was first recorded in Italy in 1915, on plants from Genoa; a second report was made from Palermo in 1929 on carnations introduced from the Ligurian Riviera [ibid., x, p. 386]; and a third attack, described as severe, was noted in 1935 at San Remo. From two years' observations the author concludes that the disease is not very extensively present in the vicinity of San Remo. Even in periods very favourable to the fungus, infection is confined to limited areas. The disease becomes dangerous only if it attacks the few individuals of highly prized varieties being used for propagating purposes.

Calvino (Eva M.). **Due casi di 'cancro della Gardenie'.** [Two cases of *Gardenia* canker.]—*Costa azzur. agric.-flor.*, xix, 11–12, pp. 189–190, 1939.

In August 1935 and again in February 1937 the author received *Gardenia* plants affected by canker caused by *Phomopsis gardeniae* [*R.A.M.*, xviii, p. 33], the material in the latter year coming from Piacenza. Growers are recommended to adopt preventive spraying with a fungicide and to use cuttings from healthy plants only. It is thought that infection may be favoured by the practice of growing *Gardenia* plants in soil mixtures containing chestnut leaf mould, which holds a great deal of moisture; a mixture of heath and soil, or fibrous turf, would be preferable.

Bottomley (A[veril] M.). **A destructive Antirrhinum disease new to South Africa.**—*S. Afr. hort. J.*, ii, 2, p. 17, 1 fig., 1940.

Snapdragon (*Antirrhinum* [*majus*]) rust (*Puccinia antirrhini*) [*R.A.M.*, xviii, p. 740] has recently appeared for the first time in some coastal towns in South Africa, especially in the Eastern Cape and Natal. Until further information is available, it is recommended that only resistant varieties should be planted, infected soil should be avoided, and that all diseased plants should be burnt. The disease has probably been introduced by infected seed; every one of twelve seed samples obtained from various commercial sources was found to be contaminated.

Hansen (H. N.) & Thomas (H. Earl). **Flower blight of Camellias.**—*Phytopathology*, xxx, 2, pp. 166–170, 2 figs., 1940.

Sclerotinia camelliae n. sp. [without a Latin diagnosis], the agent of a brown spotting of *Camellia japonica* flowers in California affecting 50 varieties and causing up to 100 per cent. loss in wet weather, is characterized by buff-olive, later darkening, apothecia, with a cyathiform to discoid disk, 5 to 20 mm. in diameter and a stipe 3 to 40 mm. long and 2 to 3 mm. in diameter below the disk, tapering to 0·5 to 1 mm. at the base; cylindrical asci, 100 to 125 by 4·3 to 5·8 μ, containing eight uniseriate, ellipsoid, continuous, hyaline ascospores, 5·3 to 7 by 2·5 to 3·5 μ; filiform, septate paraphyses, 110 to 130 by 1·2 to 2·5 μ; dark brown to black sclerotia, up to 30 by 12 mm., usually laminated to simulate the imbricate arrangement of the flower petals; and globose to piriform, concatenate, hyaline (jet-black in the mass) microconidia,

2·5 to 3·5 μ, produced in a sporodochium composed of numerous clusters of conidiophores ending in tapering, elongated terminal cells. In pure culture on potato dextrose agar or sterilized whole wheat microconidia are most rapidly and abundantly formed at 24° C., vegetative development being more profuse at 15° to 18°. Infection is caused solely by ascospores and, since sclerotia are formed in the flowers only, control should be practicable by the destruction of all fallen flowers for several consecutive seasons (a minimum of two, since the sclerotia are known to persist in the soil for at least two years).

Remsberg (Ruth E.). **The snow mold of grains and grasses caused by Typhula itoana and Typhula idahoensis.**—*Phytopathology*, xxx, 2, pp. 178–180, 1940.

Two species of *Typhula* have been found to be associated with the snow mould of cereals and grasses, that occurring most commonly in the United States, Europe, and Japan being *T. itoana* [*R.A.M.*, xviii, p. 298], frequently described under the name of *T. graminum* or *Sclerotium fulvum* [ibid., xvii, p. 230]. The second species, often collected in the western United States, is *T. idahoensis* Remsberg, with which the fungus designated *T. borealis* by Ekstrand in Sweden [ibid., xvi, p. 802] is probably identical. There is further a possibility, not yet fully explored, that *T. graminum* may also cause a snow mould.

Fischer (G. W.). **Fundamental studies of the stripe smut of grasses (Ustilago striaeformis) in the Pacific Northwest.**—*Phytopathology*, xxx, 2, pp. 93–118, 4 figs., 1940.

This further instalment of the writer's studies on the stripe smut (*Ustilago striaeformis*) of grasses in the Pacific North-west [*R.A.M.*, xviii, p. 441] deals principally with certain aspects of the life-history, physiology, and pathogenicity of a new race of the fungus collected on *Agropyron pauciflorum* and *Elymus glaucus* differing from those previously recognized in important features of the germination process. In the first place, no after-ripening under moist conditions was found to be necessary for successful germination during the seven-month period of viability. The germinating spore extrudes two or three thick germ-tubes, which rapidly elongate and develop cross walls and branches. This complex promycelium in turn buds off typical elliptical sporidia, which rapidly form large colonies on nutrient agars, such as potato dextrose or malt extract dextrose-peptone. *U. striaeformis* has hitherto given no evidence of ability to pursue a saprophytic mode of existence. The sporidia are unisexual and fusion takes place within a few hours on non-nutrient agar, each fused pair giving rise to a long, vigorous aerial infection hypha. The results of mating experiments with twelve pedigreed monosporidial cultures of *U. bullata* [loc. cit.] and four of *U. striaeformis* showed that the sporidia of the two species are highly compatible, and that the greater number of infection hyphae produced by certain combinations always involved the same sex group of *U. striaeformis*.

In inoculation experiments by the partial vacuum method [ibid., xvi, p. 737] with aqueous suspensions of spores or sporidia of opposite sex, *U. striaeformis* caused more or less heavy infection (up to 100 per cent.)

on *A. caninum*, *A. cristatum*, *A. inerme*, *A. pauciflorum*, *A. smithii*, *A. subsecundum*, *A. semicostatum*, *A. spicatum*, *E. glaucus*, *E. canadensis* and its var. *robustus*, *E. sibiricus*, *Hordeum brevisubulatum*, *H. jubatum* and its var. *caespitosum*, *H. nodosum*, and *Sitanion hanseni*, of which *A. smithii*, *A. subsecundum*, *E. canadensis* var. *robustus*, *E. sibiricus*, *H. jubatum*, and *H. nodosum* are reported as new hosts of the stripe smut.

The new race of *U. striaeformis*, unlike those previously identified, appears to be seed-borne, only smutted plants being produced by seeds taken from infected individuals of *A. pauciflorum*. Of 34 selections and collections of this grass tested for reaction to the new race, only six gave any promise of utility as resistant or immune stock.

It is recommended that the new race should be known as *U. striaeformis* f. *hordei*, in keeping with the system of classification instituted by W. H. Davis [ibid., xv, p. 27] for physiologic races of the stripe smut. Notwithstanding the conspicuous differences between the new race and others in respect of spore germination, pathogenicity, culturability, sexuality, and seed transmission, the former is indistinguishable on the basis of spore morphology, and should thus probably not be accorded specific rank.

Nicolas (G.) & Aggéry [Berthe]. **Sur quelques Peronospora parasités par des bactéries.** [On some *Peronospora* species parasitized by bacteria.]—*Rev. Mycol.*, N.S., v, 1, pp. 14–19, 1940.

The conidiophores and conidia of *Peronospora trifoliorum* on material of *Trifolium incarnatum* kept in a damp chamber were found to be agglutinated into a brown, gelatinous mass and to contain large numbers of Gram-negative, rod-shaped bacteria, measuring 1·5 by 0·5 μ, and arranged singly or in pairs. The bacteria were present in all the cells, and particularly in the wood vessels, in the neighbourhood of the yellow spots on infected leaves; they passed into the mycelium, and infected and killed off the developing conidiophores and conidia. The relatively limited spread of the fungus in the field is attributed to this bacterial action.

Bacteria (of which a study has not yet been made) were also found in the mycelium, conidiophores, and conidia of *P. viciae* on vetch and *P. parasitica* on *Lepidium graminifolium*, conidial germination being reduced in each case by bacterial action.

Ark (P. A.) & Thomas (H. E.). **Apple dieback in California.**—*Phytopathology*, xxx, 2, pp. 148–154, 2 figs., 1940.

Die-back of apple trees, often accompanied by a form of measles [*R.A.M.*, xviii, p. 785], premature death of the buds, and collapse of the bark above the ground with emission of a strong odour, giving rise to the local term of 'sour sap', and occasionally by cork and drought spot of the fruit, is stated to be prevalent in the Sebastopol district of California, where the soil is definitely acid and low in available nutrients, notably potassium. A certain amount of improvement followed the treatment of a few severely affected trees with heavy applications (25 or 75 lb. per tree) of potassium sulphate. Annuals such as nasturtium (*Tropaeolum majus*), sugar beet, and sunflower, grown in soil from affected orchards, developed boron-deficiency symptoms curable by the

incorporation with the soil of small quantities of borax or boric acid. Some indications were also obtained from small-scale experiments that the application of borax (up to 10 lb.) to the soil round apple trees for a radius of 3 ft. from the trunk exerted a beneficial effect on cases of combined cork [ibid., xix, p. 29] and measles, and in some instances of die-back alone.

MacArthur (Mary). **Histology of some physiological disorders of the Apple fruit.**—*Canad. J. Res.*, Sect. C, xviii, 1, pp. 26–34, 2 pl., 1 graph, 1940.

In this preliminary study conducted in Canada in 1938 of the histological effects of the boron-amenable disorders of apples, internal cork [*R.A.M.*, xix, p. 29], corky core [ibid., xiv, p. 592], drought spot [loc. cit.], and the non-boron-amenable disorder bitter pit [ibid., xviii, p. 118], it was found that in both groups starch retention is common in all types of necrotic areas and external papillations occur on the walls of cells in close proximity to the lesions. The first group shows also abnormal meristematic activities, giving rise to three types of abnormal cells, namely, (1) a cork cambium partially or completely walling off a lesion, (2) massed linear cells, heavily papillated, and (3) reactivated individual cells or groups of cells. All three types occur in internal cork and drought spot, and all except cork cambium in corky core. Blotchy pit [ibid., xvii, p. 688], macroscopically resembling bitter pit but with larger dark green lesions mottled with brown, was found to comprise two extreme types, (1) closely similar to internal cork has a discontinuous cambium defining the lesion, and abnormal linear tissue in the intercellular spaces and lacunae of collapsed cell groups, and (2) identical in appearance with bitter pit in which there is neither cambial activity nor abnormal growth. Intergrade types occur between these two extremes. Water core [ibid., xix, p. 29] shows neither cell collapse, starch retention, papillae, abnormal growth, nor cambial activity and cannot be placed in either of the two groups of disorders.

Keitt (G. W.). **Toxicity of the sodium salts of dinitro-o-cresol to Venturia inaequalis.**—*Science*, N.S., xc, 2328, pp. 139–140, 1939.

Continuing his earlier investigations [*R.A.M.*, xvii, p. 118] the author, in the spring of 1938, carried out small-scale experiments in which overwintered apple leaves bearing abundant, mature ascospores of *Venturia inaequalis* were sprayed with elgetol, a proprietary preparation containing 12 per cent. by weight of the sodium salt of dinitro-o-cresol with the addition of a supplement to facilitate penetration. Similar leaves sprayed with water served as controls. The results obtained indicated that elgetol in water at a concentration of 1 per cent. by volume reduced ascospore discharge (average of three trials) by 99·7 per cent. Other tests [cf. ibid., xvii, p. 121] indicated that the lethal concentration of elgetol to the two isolates of *V. inaequalis* tested was approximately 0·05 per cent. by volume.

Bratley (C. O.). **Development of scab on stored Apples, 1938–1939.**—*Phytopathology*, xxx, 2, pp. 174–178, 1 fig., 1940.

In February, 1939, several lots of apples from Pennsylvania, New

Jersey, Massachusetts, and the Hudson Valley of New York on the New York City market were observed to bear the characteristic storage type of scab [*Venturia inaequalis*] lesions, those on Stayman Winesap, Baldwin, and Stark being $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter and jet-black, while the dark brown spots on Rome Beauty measured less than $\frac{1}{16}$ in. Many lots of Stayman Winesap and Rome Beauty originating in eastern Pennsylvania picked and stored during the first three weeks of October showed 80 to 90 per cent. infection, whereas McIntosh and Delicious from the same orchard, gathered a month earlier, were scab-free. The final spray application in the affected orchards was given during the first week of July. Information from other north-eastern fruit-growing areas corroborated these data as regards the susceptibility to late scab of October-picked fruit. Previous experiments by the writer having shown the importance of protracted moisture in the development of the disease [*R.A.M.*, xvii, p. 118], an attempt was made to correlate the present outbreak with late summer (1938) weather conditions in the north-east, and it was ascertained that heavy rain fell daily from 17th to 21st September, preceded by intermittent rains from the 12th onwards, thus affording ideal conditions for the growth of the fungus. The only area (Rochester, New York) escaping abnormal precipitation was likewise free from an excessive incidence of scab.

Cooley (J. S.) & Davidson (R. W.). **A white root rot of Apple trees caused by Corticium galactinum.**—*Phytopathology*, xxx, 2, pp. 139–148, 4 figs., 1940.

In 1932, *Corticium galactinum* [*R.A.M.*, vii, p. 176; xviii, p. 321], no mention of which could be traced in phytopathological literature since 1909, was observed as an active parasite of apple roots in Virginia, and it has subsequently been found in Maryland, Tennessee, Delaware, and Indiana, occurring exclusively in orchards planted on new land or adjoining woods. Infection usually originates at the collar or on the larger roots and spreads rapidly outwards on the smaller ones, causing the sudden death of the whole tree, often without any premonitory aerial symptoms. The white hyphal strands on the root surface develop into a dense weft of mycelium which gradually penetrates the epidermis, cortex, cambium, and wood. The cambium is not uniformly destroyed, growth and enlargement of the tissues surrounding the killed areas sometimes taking place and resulting in the formation of pits and bumps over the root surface; in other cases there may be general hypertrophy of the root at the junction of the diseased and healthy parts. Although the course of infection on individual trees is so rapid, its advance from tree to tree and from one orchard to another appears to be relatively slow.

Young apple trees were successfully inoculated with naturally diseased roots and pure cultures of the fungus, dug and stored seedlings being much more susceptible than those infected *in situ*. Other plants contracting infection by *C. galactinum* in the vicinity of diseased apple trees included *Rubus alleghaniensis*, *R. flagellaris*, *R. phoenicolasius*, dogwood (*Cornus florida*), sumac (*Rhus glabra*), and white campion (*Lychnis alba*). Recently the disease was also observed in an ornamental planting close to an oak stump near Hyattsville, Maryland,

necessitating the removal of a young holly, a dogwood, and two *Kalmia* bushes.

In the main, the light to ochraceous-buff fructifications of *Corticium galactinum* on apple roots agree with Burt's description in the Thelephoraceae of North America XV [ibid., vi, p. 125], except that he does not mention the conspicuous paraphyses, projecting up to 12 μ above the surface of the hymenium and penetrating the subhymenium to a depth of 30 to 40 μ. The optimum temperature for development was found to be between 25° and 31° C. and the maximum just above 34°.

SAKIMURA (K.). **Thrips nigropilosus Uzel, a non-vector of the yellow spot virus.**—*J. econ. Ent.*, xxxii, 6, p. 883, 1940.

After stating that yellow spot [of pineapple] is probably a synonym of spotted wilt (the evidence for which view is being given in a forthcoming paper) the author presents data obtained in experiments in Hawaii in which adults of *Thrips nigropilosus* and *T. tabaci*, bred on yellow spot-affected *Emilia sonchifolia*, potato, eggplant, and *Datura stramonium* plants, were transferred to a number of susceptible test plants. It may safely be concluded that *T. nigropilosus* is not a vector because not one out of a total of 668 individuals of *T. nigropilosus* transmitted the virus, which was, however, transmitted by *T. tabaci* from the same or similar infected plants.

In preliminary transmission experiments, 250 adult *Hercinothrips femoralis* from infected *E. sonchifolia* and celery were unable to transmit the virus.

MULLER (H. R. A.). **Overzicht van de belangrijkste Mangga-ziekten in Nederlandsch Indië.** [Survey of the most important Mango diseases in the Dutch East Indies.]—*Meded. alg. Proefst. Landb., Batavia*, 40, 9 pp., 1940. [English summary.]

Mangoes are liable to infection in the Dutch East Indies by *Rhizoctonia* [*Corticium*] *solani*, causing damping-off of seedlings; anthracnose (*Gloeosporium mangiferae*) [*Glomerella cingulata*: *R.A.M.*, xiv, p. 518; xviii, p. 750], attacking seedlings, nursery plants, and the leaves, twigs, inflorescences, and fruits of older trees; bark canker (*Physalospora* sp.); and *Botryodiplodia theobromae* [ibid., xvii, p. 331], occurring only as a wound parasite on trees damaged, e.g., by sun scorch, tar, or tanglefoot.

C. solani may be combated by soil treatment with ceresan (5 l. of a 1 in 5,000 solution per sq. m.) and spraying the seedlings with 1·5 per cent. Bordeaux mixture; *P.* sp. and *B. theobromae* by excision of the diseased cortex and the application to the wounds of a mixture of 92 per cent. hard paraffin wax and 8 per cent. carbolineum plantarium; and *G. cingulata* by regular spraying with Bordeaux mixture.

POLYAKOFF (I. M.). Новый протравитель комплексного действия. [A new fungicide of complex action.]—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 60–72, 1939.

In extensive field tests with condensat [*R.A.M.*, xviii, p. 605] conducted during 1937 to 1939 on a large number of collective farms in different parts of the U.S.S.R., the fungicide was found to be equally effective in controlling wheat bunt [*Tilletia caries* and *T. foetens*] and

smuts of cereals [*Ustilago* spp.] in all varieties and in all the localities tested, whether applied by the wet or the semi-dry method and either by hand or machine. It can also be used in combination with vernalization. For the control of bunt and smuts concentrations of condensat equivalent to 0·1 per cent. of formaldehyde, applied in the same way as formalin, are recommended.

In a field test with cotton, solutions of condensat containing 0·1 per cent. formaldehyde reduced the amount of gummosis [*Bacterium malvacearum*: ibid., xvii, p. 815] infection in bolls, leaves, and stems to 2·8, 24·2, and 27·1 per cent., respectively, as compared with 56·7, 76·4, and 95·5 per cent. for the untreated control and 7·6, 49·2, and 49·5 per cent. for plants treated with formalin; both condensat and formalin depressed germination very slightly.

In laboratory tests with cabbage diseases, *Plasmodiophora brassicae* and *Alternaria brassicae* were killed after five minutes exposure to solutions of condensat containing 0·5 per cent. formaldehyde, and *Moniliopsis aderholdi* by exposure to a solution of half this strength. Disinfecting the soil with aqueous solutions of condensat containing 0·5 per cent. formaldehyde at the rate of 1 : 8 by volume of soil completely controlled *M. aderholdi*, while a solution containing 2 per cent. formaldehyde applied at the same rate was effective against *P. brassicae*, the untreated control giving 70 to 100 per cent. infection. Soil disinfection had no adverse effect on seed germination and the growth of the plants.

MANIL (P.). **A propos de l'appréciation de l'activité des produits fongicides.** [On the estimation of the activity of fungicides.]—*Bull. Inst. agron. Gembloux*, viii, 3–4, pp. 215–222, 1939. [Flemish, German, and English summaries.]

After briefly discussing the desirability of devising some standard test for estimating the anti-parasitic activity of fungicides the author describes laboratory experiments which showed that the relative effectiveness of different materials tested may prove widely different according to the method of testing adopted [*R.A.M.*, xviii, p. 753]. For example, when phenol, mercuric chloride, and uspulun were tested against *Aspergillus niger* and *Penicillium glaucum*, it was found that the minimal antiseptic dosages were much higher on beer wort agar than in liquid beer wort, the phenolic coefficients also differing on the two media, while in another experiment when the same three materials were tested against spore suspensions, it was found that the minimal dosages required to kill the spores of both fungi in one hour were considerably higher than those inhibiting growth on liquid or solid media.

Specialpraeparater til Bekaempelse af Plantesygdomme og Skadedyr anerkendte af Statens Forsøgsvirksomhed. Gyldig for Aaret 1940. [Special preparations for the control of plant diseases and pests recognized by the State Experiment Service. Valid for the year 1940.]—*Tidsskr. Planteavl*, xliv, 3, pp. 486–495, 1940.

This is a list of proprietary plant protectives, officially tested and approved for 1940 by the Danish State Experiment Service, with the appropriate concentrations for use against various well-known diseases and pests [cf. *R.A.M.*, xviii, p. 332].

Rittenberg (S. C.). **Investigations on the microbiology of marine air.** —*J. mar. Res.*, ii, 3, pp. 208–217, 1939 (issued January, 1940).

The micro-organisms occurring in the air over an area off the Pacific Coast ranging from Cedros Island to Monterey, and from the mainland to 400 miles at sea, were studied during 1938–9 by exposing Petri dishes containing nutrient media to the atmosphere on board the research vessel *E. W. Scripps* (Scripps Institution of Oceanography, University of California). Moulds were the predominant group of organisms [cf. *R.A.M.*, xviii, p. 44], representing over 50 per cent. of the population, distributed among the following genera: Actinomycetes (2), *Alternaria* (6), *Aspergillus* (2), *Catenularia* (1), *Cephalosporium* (7), *Cladosporium* (7), *Helminthosporium* (7), *Hormodendrum* (15), *Macrosporium* (2), *Penicillium* (18), *Plenozythia* (1), *Spicaria* or *Paecilomyces* (1), *Sporotrichum* (7), *Stemphylium* (3), and *Trichoderma* (1). Most of these are common soil forms and their numbers diminished with increasing distance from the shore.

Jacobs (W. C.). **A discussion of physical factors governing the distribution of microorganisms in the atmosphere.**—*J. mar. Res.*, ii, 3, pp. 218–224, 1939 (issued January, 1940).

Discussing the relation of physical factors to the distribution of micro-organisms in the atmosphere with reference to Rittenberg's data on the incidence of moulds off the coast of California [see preceding abstract], the writer points out that the average count per hour for the region from 0 to 100 miles distant from land is 155·6 compared with only 29 at 100 to 400. As regards the origin of the fungi, the prevailing winds in southern California are from the sea, so that if the moulds under observation were primarily of land origin, they must either have been borne eastwards from the far removed territories bordering the North Pacific Ocean on the west or north, or been transported from the United States westwards across the prevailing wind stream through lateral mixing. The horizontal distance over which the individual organism may be conveyed is almost limitless, being largely determined by ability to survive the atmospheric environment.

Wishart (J.). **Field trials: their lay-out and statistical analysis.**— 36 pp., 5 figs., Cambridge, Imperial Bureau of Plant Breeding and Genetics, 1940. 2*s.* 6*d.*

In this publication the author clearly explains, with numerous examples, how the reliability of field trials with different lay-outs can be estimated by statistical analysis of the data obtained, the points covered including the measurement of experimental error, the method of randomized blocks, analysis of variance, the Latin square, multiple factor experiments, the split plot, 'confounding', and breeding experiments with large numbers of varieties.

Edson (H. A.) & Wood (Jessie I.). **Crop losses from plant diseases in the United States in 1938.**—*Plant Dis. Reptr, Suppl.* 118, pp. 85–118, 1939 (issued March, 1940). [Mimeographed.]

Tables are given showing the estimated reductions from fungal, bacterial, virus, and other diseases of fruit, vegetable, cereal, tomato,

and tobacco crops in the United States in 1938 [cf. *R.A.M.*, xviii, p. 405].

Naoumoff (N. A.). О новых заболеваниях растений, вызываемых новыми или малоизвестными грибами. [On new diseases of plants caused by new or little known fungi.]—*Sovetsk. Bot.*, *1939*, 8, pp. 75–84, 1939.

Discussing the possible sources of new diseases, such as natural migration of the parasitic fungi, their introduction by man on infected plants or seeds, and the development of new forms by mutation, the author furnishes interesting short histories of the spread of some pathogens, accompanied in some cases by tables showing the chronological order of first appearances of a given fungus in different countries. A list is presented of rare or new fungi found between 1934 and 1938 in the Leningrad State University preserve in the Kursk district, including *Cercosporella piri* on pear. It is pointed out that host plant and pathogen may have the same or different countries of origin and accordingly a distinction is made between 'synpatrial' and 'heteropatrial' parasites.

Kausche (G. A.). **Untersuchungen zum Problem der biologischen Charakterisierung phytopathogener Virusproteine.** [Studies on the problem of the biological characterization of phytopathogenic virus proteins.]—*Arch. ges. Virusforsch.*, i, 3, pp. 362–372, 12 figs., 1940.

This paper, presented at the Seventh International Congress of Genetics, held in Edinburgh in 1939, is a summary and critical discussion of the latest contributions towards the solution of the problems surrounding the nature of phytopathogenic viruses, including those of the writer and Stubbe on the tobacco mosaic mutants arising as a sequel to X-ray irradiation [*R.A.M.*, xix, p. 46], experiments with which are still in progress. In the author's view, there is no justification at present for an identification of the virus proteins with gene molecules, the latter being fundamental prerequisites for the manifestation of any biological properties, whereas the former are the product of infection on the normal albumin metabolism of the plant organism and the result of an autocatalytic synthesis having to be renewed exogenously for each individual. The most that can be said is that there are certain experimentally established analogies between virus proteins and genes which encourage the further study of the macromolecules of the former in relation to the problem of the biological characterization of both elementary units.

Rawlins (T. E.) & Tompkins (C. M.). **Carborundum for plant-virus inoculations.**—*Phytopathology*, xxx, 2, pp. 185–186, 1940.

Powdered carborundum, 600-mesh, suitable as an abrasive in plant virus inoculations [*R.A.M.*, xv, p. 737], is stated to be available in any quantity from the Braun-Knecht-Heimann Company, San Francisco, who stock the product under the number 38713. On arrival the product should be placed in a dry heat sterilizer at 80° to 90° C. for as long as

is necessary to remove all superfluous moisture (which causes aggregation of the particles) and stored in tight-stoppered receptacles.

Vorobieva (Mme M. N.). Азотистый обмен у растений при вирусных заболеваниях. [Nitrogen exchange in plants infected by viruses.]—*Bull. Acad. Sci. U.R.S.S., 1939*, Sér. biol., 6, pp. 1103–1115, 1939. [English summary.]

Under southern Russian conditions degeneration of potatoes is stated to be correlated with early planting and probably due to high temperatures, and it was found by experiments in Moscow during 1936–7 that potatoes planted in summer differed little from the normal in appearance and chemical metabolism, while those planted in spring showed an increase in ammoniacal and amide nitrogen both in the tubers and green parts. This increase was also witnessed in plants grown from degenerated tubers under glass at temperatures lower than those prevailing in southern Russia. Similar increases were detected in potato tubers subjected to artificial heating and also in the plants developing from such tubers. Potatoes attacked by rugose or aucuba mosaics also showed an increase in ammonia nitrogen but little increase, or even a decrease, in amide nitrogen [cf. *R.A.M.*, xvi, p. 707; xix, p. 39]; as compared with a value of 100 for tubers and green parts of healthy Epicure potatoes, the amounts of ammonia nitrogen in early sown ones and those affected with rugose mosaic were 242·2 and 220·5 in tubers and 124·8 and 140·1 in green parts, respectively, the corresponding figures for amide content being 124·9 and 108·1 and 142·0 and 94·6, respectively. Similarly, with Hollander potatoes the ammonia nitrogen values in aucuba-diseased tubers and green parts were 111·5 and 118·5, respectively, and those of amide nitrogen 58·2 and 36·7, respectively, the values for healthy plants being 100. The nitrogen metabolism of tobacco plants artificially infected with the tobacco mosaic virus varied: the susceptible *Nicotiana tabacum* vars. *macrophylla, chinensis,* and Havana showed a gradually rising increase in the amount of protein, while the resistant *N. glutinosa* and *N. rustica* showed a decrease. The contents of ammoniacal and amide nitrogen in infected tobacco plants exhibited great irregularity, following apparently no rules.

Goss (R. W.). **A dry rot of Potato stems caused by Fusarium solani.**—*Phytopathology*, xxx, 2, pp. 160–165, 1 fig., 1940.

A disease of Bliss Triumph potatoes in Nebraska and North Dakota, involving a dry, shredded rot of the underground stem and destruction of the roots with consequent aerial wilting (or, under high soil moisture conditions, rosetting and purpling of the foliage and aerial tuber formation), was found to be due to a strain of *Fusarium* (No. 242) morphologically similar to *F. solani* and provisionally identified with this species. The typical symptoms of the trouble were induced either by stem inoculation or the cultivation of plants in sterilized or unsterilized infected soil, the causal organism being recovered from any of the discoloured or rotted tissues. Comparative inoculation tests showed *F. solani* to be more virulent on potatoes than *F. oxysporum* or *F. avenaceum*, but less so than *F. solani* var. *eumartii* [*R.A.M.*, xviii,

p. 52], the following being the amounts of infection obtained: stem inoculations on ten plants with *F. avenaceum*, *F. oxysporum*, *F. solani* var. *eumartii*, and *F solani* No. 242, 4, 8, 10, and 8, respectively; sterilized soil inoculated, 6 out of 29, 5 out of 18, 20 out of 20, and 27 out of 27, respectively; unsterilized soil inoculated, 9 out of 24 and 11, 25, and 20, respectively, out of 25. It will be seen that *F. solani* produced almost as high an incidence of infection as its var. *eumartii*, but without aerial wilting. Other potato isolates morphologically similar to *F. solani*, as well as a strain of *F. solani* from squash, proved to be non-pathogenic to potato plants and only weakly so to the tubers. *F. solani* was found to be capable of acting as a wound parasite on potato tubers, but not of attacking them through the stolons. In culture the optimum temperature for the fungus was 30° C., good growth also being made at 35°, but little at 10° and none at 5°.

Eddins (A. H.). **Potato seed-piece rot caused by Fusarium oxysporum.** —*Phytopathology*, xxx, 2, pp. 181–182, 2 figs., 1940.

Fusarium oxysporum, isolated from decaying potato seed pieces [see preceding abstract] at the Florida Agricultural Experiment Station, where it has been present since 1934, but caused appreciable loss (10 per cent. and upwards) only in 1936, was shown by inoculation experiments to be pathogenic. In one series, pure cultures of the fungus on squares of potato dextrose agar were applied to the cut surfaces of seed pieces, which were then planted, together with uninoculated material, in sterilized soil. On removal 28 days later, all the inoculated pieces were partly or wholly decayed and had either not germinated or produced only weak sprouts, whereas the uninfected controls were healthy and vigorous. In another series, 25 inoculated and 25 uninoculated seed pieces from the same tubers were planted in rows in which one ton of fertilizer per acre had been distributed a fortnight earlier. A month later all the inoculated and 14 of the uninoculated pieces were in process of rotting and yielded *F. oxysporum*.

Dowson (W. J.). **Identity of the bacterium causing Potato blackleg.**— *Nature, Lond.*, cxlv, 3668, p. 263, 1940.

From potato plants affected with blackleg the author isolated an organism which produced acid and gas in maltose and characteristic blackening when inoculated into the stem of living potato plants; in comparative studies, a soft-rotting organism isolated from carrots produced only wilting upon inoculation, and failed to form acid in maltose [cf. *R.A.M.*, v, p. 407; x, p. 125]. The blackleg organism is, therefore, apparently not identical with what is generally accepted as *Bacterium carotovorum* [*Erwinia carotovora*], and the author names it *Bact. phytophthorum* (Appel) n. comb. [cf. ibid., xvi, p. 302; xix, p. 117].

Metzger (C. H.) & Glick (D. P.). **A promising method for eradicating bacterial wilt and ring rot from the Potato.**—*Amer. Potato J.*, xvii, 2, pp. 45–53, 1940.

In 1939 the writer carried out trials at the Mountain Substation (Minturn) of the Colorado Agricultural Experiment Station to determine the applicability to the elimination of bacterial wilt and ring rot

(*Pseudomonas sepedonica*) [*Bacterium sepedonicum*: *R.A.M.*, xix, p. 299] of the following method of microscopic examination of tuber and stem smears. Nineteen lots of the nine standard varieties for the State, viz., Bliss Triumph, Chippewa, Irish Cobbler, Katahdin, Red McClure, Rural New Yorker, Russet Burbank, Russet Rural, and White Rose were secured from sources believed to be nearly free from infection, the tubers dipped in a solution of semesan bel, cut through the stem end, and all showing vascular discoloration (21 per cent.) discarded. From each of those remaining a segment comprising a portion of the vascular ring was cut and pressed against a smeared slide to leave an imprint, the tuber being again dipped in semesan bel to disinfect the cut surface. The smears were heated in a flame and stained by the Gram method, using the modification of Racicot *et al.* [ibid., xviii, p. 201]. Of the 1,684 smears microscopically examined under an oil-immersion objective, representing 421 tuber units and 14 lots, 5 per cent. exhibited micro-organisms, resulting in the rejection of 11 per cent. of the units. An additional lot of 714 stem smears from a field of the Peachblow variety was apparently free from infection. If it is only possible to investigate one type of smear, that made from the stem base is believed to be a more reliable index of bacterial invasion than that derived from the tuber.

Meyer (C.). **Eenige resultaten van proeven en waarnemingen over het optreden van Aardappelschurft.** [Some results of experiments and observations on the occurrence of Potato scab.]—*Tijdschr. PlZiekt.*, xlvi, 1, pp. 19–29, 1940.

This is a summary of the outstanding results so far obtained in investigations on potato scab (*Actinomyces scabies*) undertaken by the Dutch State Agricultural Experiment Station and to be described in fuller detail by the responsible authorities in a forthcoming publication. On certain soils, e.g., sand with not more than 5 per cent. humus, the hydrogen-ion concentration may be reduced to a level consistent with profitable yields by treatment with flowers of sulphur. Of the other inorganic fertilizers tested, slaked lime (2 to 36 tons per hect.), though it sometimes reduced the incidence of infection in the year of treatment, was quite unreliable and was furthermore apt to cause adverse after-effects. Among the organic manures, blood and fish meal (10 tons per hect.) were beneficial but too expensive. The most satisfactory of the chemicals tested in direct control experiments was mercuric chloride when applied at the rate of 800 c.c. of a solution containing 0·4 gm. per plant hole. Yellow mercuric oxide at the same strength also gave moderately good results, but not equal to mercuric chloride, and the price is higher. Aretan [*R.A.M.*, xix, p. 198] (4 gm.) gave good results in a test on sandy clay, but seems to be less reliable than mercuric chloride at a much lower strength. Brassicol [ibid., xvi, p. 653] also proved effective at the rate of 6 gm. per plant hole, but its exorbitant cost and high lime content are great disadvantages. Calomel [mercurous chloride] acted similarly to mercuric chloride at the same strength, but is dearer and, being insoluble, less easily applied. Formalin proved unreliable. Germisan acted favourably at the rate of 2·5 gm. per plant hole, but is too expensive, and the same applies to ferric chloride at 20 gm.

HEMMI (T.) & IMURA (J.). **On the relation of air-humidity to conidial formation in the rice blast fungus, Piricularia oryzae, and the characteristics in the germination of conidia produced by the strains showing different pathogenicity.**—*Ann. phytopath. Soc. Japan*, ix, 3, pp. 147–156, 1939. [Japanese, with English summary.]

When rice seedlings were sprayed with a conidial suspension of *Piricularia oryzae* [*R.A.M.*, xviii, p. 546] and placed, as soon as the leaves showed the characteristic spotting, in desiccators in which the air was kept at constant humidities, it was ascertained that the fungus is able to produce conidia in the spots in air of 93 per cent. or more relative humidity. At 89 to 90 per cent. relative humidity, conidial production was scanty, while at 88 per cent. it was absent. The percentage of germinated conidia and the length of the germ-tubes produced did not appear to be correlated with differences in the pathogenicity of various strains, but a strain of the strongest pathogenicity showed more tendency than did a strain of the weakest to produce two germ-tubes from a single conidium.

AKAI (S.). **On the ash figures of the leaves of the Rice plants transplanted from the different kinds of nursery beds and their susceptibilities to the blast disease.**—*Ann. phytopath. Soc. Japan*, ix, 4, pp. 223–235, 1939. [Japanese, with English summary.]

In Japan, mature rice plants transplanted from the nursery beds at the seedling stage show different degrees of susceptibility to blast (*Piricularia oryzae*), plants originating from wet nursery beds being more resistant than those from dry. It was concluded from a comparison of the ash figures for leaves of rice plants [*R.A.M.*, xvii, p. 622] from these two kinds of beds that the number of silicated epidermal cells (especially of the bulliform cells) per unit area was greater in plants from the humid than in those from the arid beds. Bulliform cells are more easily penetrated by the fungus than the long and short cells, and it is possibly significant that the number of silicated bulliform cells varies in accordance with these different conditions in the seedling stage.

SUZUKI (H.). **Influence of physical and chemical factors upon the formation of appressoria in the conidia of Piricularia oryzae. I. Influence of oxygen.**—*Jap. J. Bot.*, x, 3, pp. 321–324, 1 pl., 1939.

The author describes experiments to determine the influence of oxygen on appressorium formation by the conidial germ-tubes of *Piricularia oryzae* [see preceding abstracts] in drops of glucose solution placed on pieces of cellophane. The minimum oxygen concentration for conidial germination was found to lie between 0 and 5 per cent., and for appressorial formation between 10 and 15 per cent.

YABUTA (T.) & HAYASHI (T.). **Biochemical studies on bakanae fungus of the Rice. Part III. Studies on physiological action of gibberellin on the plant.**—*J. agric. chem. Soc. Japan*, xv, 4, pp. 403–413, 16 figs., 2 graphs, 1939. [Japanese, with English summary in *Bull. agric. chem. Soc. Japan*, xv, 4, pp. 82–83, 1939.]

After ten days in a water culture solution containing 0·14 to 3·5 mg. gibberellin (the active principle of the 'bakanae' fungus of rice [*Gib-*

berella fujikuroi: *R.A.M.*, xviii, p. 707]), young shoots of barley, buckwheat, *Phaseolus radiatus* var. *typicus*, rape seed, *Luffa cylindrica*, tomato, cucumber, cucurbit, and morning glory [*Ipomoea* (?) *nil*] showed abnormal elongation similar to that observed in infected rice. The same effects were induced by the injection of an aqueous solution of the stimulant into cucumber, cucurbit, *I.* (?) *nil*, soy-bean, and *P. angularis*, and by its application, mixed with lanoline, to the basal shoots of cucumber.

MARTIN (A. L.). **The effects of magnesium and calcium on 'white tip' of Rice.**—*Amer. J. Bot.*, xxvi, 10, pp. 846–852, 2 figs., 6 graphs, 1939.

During the mid-season and late growing periods in Texas rice is frequently affected by a physiological disorder ('white tip'), in which white, chlorotic areas appear at the tips of one or more of the new leaves. When the condition has reached a more advanced stage, the chlorotic area spreads and usually affects about half the leaf, the leaf tip drying up to a distance of half an inch or more. When the flag leaf is affected, the panicle sheath remains tightly rolled, the head being compressed on emerging from the boot. Often, the sheath is so tightly twisted that the head emerges through the side, and the few flowers borne on heads emerging in this way are often sterile, or give distorted grains, with resultant decrease in yield.

When rice plants were grown in soil and water cultures low in magnesium similar symptoms developed, though the condition was eliminated when 81 and 27 p.p.m. of magnesium were added to the two types of cultures, respectively. Toxic effects were, however, produced, normal plants being obtained only when calcium was also supplied.

In the soil cultures, calcium was not toxic in low concentrations. In the magnesium-free water cultures 9 p.p.m. or more of calcium produced stunting and brown leaf-spotting, though these effects were no longer observed when sufficient magnesium was added. The best growth with absence of leaf injury occurred in culture solutions containing 27 p.p.m. each of magnesium and calcium. Cultures containing 81 and 243 p.p.m. of magnesium each plus 243 p.p.m. of calcium gave almost equally good results.

Boron in agriculture.—36 pp., 17 figs., 1 graph, London, Boron Agricultural Bureau, 1940.

This is a succinct, well-illustrated review of the best-known literature dealing with boron deficiency, the information given being arranged in three main sections, viz., agricultural crops, horticultural crops, and crops foreign to Great Britain. A bibliography of 112 titles is provided.

KEYWORTH (W. G.) & DAVIES (D. L. G.). **Hop diseases. A report of the preliminary investigations carried out in 1938 and 1939 on certain Hop diseases.**—Reprinted from *J. Kent Br. N.F.U.*, Dec. *1939*, and Jan. *1940*, 18 pp., 1940.

Much of the subject matter of this paper has already been noticed in this *Review*. In small-scale experiments conducted during 1939 on

the control of *Verticillium* wilt (*V. albo-atrum* and *V. dahliae*) [*R.A.M.*, xviii, p. 709] soil disinfection with formalin gave promising results; of the 11 commercial and 9 other hop varieties tested all proved equally susceptible to the disease. A survey of hop gardens affected with nettlehead [ibid., xviii, p. 817] showed that in 'square-plant' gardens the disease spreads in all directions, whereas in 'Worcester-plant' gardens it spreads to a much greater extent along the rows than across them. The mode of spread of the disease from one garden to another is not yet fully understood, but it is almost certainly introduced by the planting of infected sets. Other diseases included in this report are mosaic [ibid., xvi, p. 836], split leaf [ibid., xv, p. 462], from which none of the gardens visited during 1939 was entirely free, split leaf blotch, fluffy tip [ibid., xviii, p. 295], *Armillaria mellea* [ibid., xvi, p. 822], the outbreaks of which were found almost invariably associated with grubbing of trees from the affected area a year or two previously, small hop [ibid., xv, p. 462], and canker caused by *Fusarium sambucinum* [ibid., xviii, p. 760]. Two diseases of unknown origin were observed in some hop gardens, one characterized by a sometimes severe stunting of the hills, and the other, fairly common on Fuggle hops, by an interveinal scorching on the six or eight leaves in the middle of the bine, badly affected leaves often curling up and eventually dropping off.

REESE (E.). **Additions to the powdery mildew flora of Pennsylvania.**— *Proc. Pa Acad. Sci.*, xiii, pp. 70–75, 1939.

This is a critically annotated list of the powdery mildews of north-eastern Pennsylvania, supplementing the catalogue of Overholts and Campbell (1934) for the central part of the State. A table is given showing some of the dimensional variations between the writer's specimens and those of Salmon. Thus, the perithecia of *Uncinula salicis* [*R.A.M.*, xiii, p. 399] on willow (*Salix humilis*) and poplar (*Populus grandidentata*) in Pennsylvania measure 135 to 188 μ compared with 90 to 175 (average 135) μ as reported by Salmon; the asci number 6 to 16 instead of 8 to 14 and measure 32 to 47 μ in width in place of 30 to 40 μ. Other divergences include the following: *U. necator* on wild vine (Pennsylvania), perithecia 98 to 145 μ, 4 to 11 asci (usually 6 to 8) measuring 47 to 67 μ in length, compared with 70 to 128 (average 96) μ, 4 to 6, rarely 6 to 9, and 50 to 60 μ, respectively, for Salmon's specimens; *Podosphaera oxyacanthae* on *Prunus* spp. and other hosts (Pennsylvania), perithecia 77 to 121 μ, asci 54 to 87 by 40 to 67 μ, whereas Salmon's figures are 64 to 90 μ and 58 to 90 by 45 to 75 μ, respectively; *Sphaerotheca humuli* on strawberry, hops, and other plants (Pennsylvania), perithecia 80 to 129 μ in diameter, asci 73 to 108 μ in length, as against Salmon's measurements of 58 to 120 and 45 to 90 μ, respectively; *S. humuli* var. *fuliginea* on various wild hosts (Pennsylvania) had perithecia 67 to 121 μ, instead of 'smaller than *S. humuli*, down to 50 μ', as reported by Salmon; *Microsphaera alni* on alder (*Alnus incana*) and various other hosts (Pennsylvania) had perithecia 81 to 145 μ in diameter, as against 66 to 135 μ (Salmon) and *M. alni* var. *extensa* on red oak (*Quercus* sp.) (Pennsylvania), perithecia 118 to 151 μ in diameter, 11 to 21 appendages, and 3 to 5 asci, as against 90 to 140 (average 115) μ, 8 to 19, and 3 to 8, respectively (Salmon).

Săvulescu (T.). **Contribution à la connaissance des Urédinées de Roumanie.** [A contribution to the knowledge of the Uredineae of Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxi, 3–4, pp. 1–11, 10 figs., 1939.

Three of the six rusts critically described in this paper [cf. *R.A.M.*, xvii, p. 556] are new to Rumania, two are new to science, and one is a new variety [the three latter being furnished with Latin diagnoses]. *Aecidium petroselini-sativi* n. sp., observed in June 1930 causing a spotting of parsley leaves in the Dobrudja, is characterized by hypophyllous, cupulate aecidia, 189 to 320 by 150 to 300 μ, consisting of rhomboid or irregular peridial cells, 24 to 38 by 9 to 18 μ (mostly 22 to 33 by 12 to 18 μ), with verrucose walls, and angular to globose, densely verruculose, subhyaline spores, 15 to 21 by 13 to 20 (17 to 18 by 15 to 18) μ.

Da Câmara (E [M]. Da S.) & Da Luz (C. G.). **Mycetes aliquot Lusitaniae III.** [Some fungi of Portugal III.]—*Agron. lusit.*, i, 2, pp. 167–199, 4 pl., 1939.

This further instalment of the authors' annotated catalogue of Portuguese fungi [*R.A.M.*, xviii, p. 711] comprises some 90 species, of which ten are new and 37 additions to the known mycoflora of the country. Among the latter may be mentioned *Septoria agrestis* on wheat leaves, *Oidium cinarae* on leaves of *Tropaeolum majus*, *Erysiphe lichenoides* [*Oidiopsis taurica*] on stems of *Foeniculum vulgare*, and *Sphaeropsis mespili* on fruits of *Cotoneaster*, the last-named being queried as *S. malorum* Peck [the pycnidial stage of *Physalospora obtusa*].

Viennot-Bourgin (G.). **Contribution á la connaissance de la mycoflore de l'Archipel de Madère.** [A contribution to the knowledge of the mycoflora of the Archipelago of Madeira.]—*Ann. Éc. Agric. Grignon*, Sér. 3, i (*1938–1939*), pp. 69–169, 6 pl., 21 figs., 1939.

In the second part of this paper the author gives a descriptive list of 153 parasitic fungi found by him on the archipelago of Madeira in 1936, and including 63 species of *Puccinia*, 26 of *Uromyces*, 8 of *Rostrupia*, 8 of *Tilletia*, and 5 of *Ustilago*. Of these fungi the following may be mentioned: *Kuhneola* [*Cerotelium*] *fici* [cf. *R.A.M.*, xvi, p. 207] on fig; *Puccinia allii* on *Allium ampeloprasum*; *P. antirrhini* on *Antirrhinum majus*; *P. iridis* (in the uredo stage only) on cultivated *Iris*; *P. pruni-spinosae* (uredo stage only) occurred in numerous localities on plum; *Uromyces fabae* on broad bean; *Entyloma dahliae* on *Dahlia*; *Ustilago cynodontis* on *Cynodon dactylon*; *Polythrincium* [*Dothidella*] *trifolii* on *Trifolium ligusticum*; *Septoria petroselini* on parsley; and *Gnomonia veneta* on *Platanus occidentalis*, causing considerable damage. Vines were almost everywhere attacked by *Plasmopara viticola* and showed severe infection by *Uncinula necator*.

Martin (G. W.). **Outline of the fungi.**—*Univ. Ia Stud. nat. Hist.*, xviii, 1, pp. 1–40, 1940.

This is a revision of the writer's 'Key to the families of fungi, exclusive of the lichens' [*R.A.M.*, xvi, p. 341].

JENKINS (ANNA E.) & BITANCOURT (A. A.). **Illustrações das doenças causadas por «Elsinoë» e «Sphaceloma» conhecidas na America do Sul até Janeiro de 1936.** [Illustrations of the diseases caused by *Elsinoe* and *Sphaceloma* known in South America up to January 1936.]—*Arq. Inst. biol. S. Paulo*, x, pp. 31–60, 11 pl., 1939. [English summary.]

The 13 plant diseases due to species of *Elsinoe* and *Sphaceloma* recorded in South America up to January, 1936, are critically discussed and figured [*R.A.M.*, xvii, p. 70]. Poplar anthracnose (*S. populi*), originally reported by Spegazzini from Chile (*Rev. Fac. Agron.*, vi, p. 183, 1910) as *Hadrotrichum* (?) *populi* [ibid., xii, p. 661], also occurs in the Argentine [*R.A.M.*, xvi, p. 5] and Minas Geraes, Brazil.

According to a personal communication from Sydow to the first-named author, *E. amazonica* was found on *Iresine argentata* in Puerto Rico in 1886 and 1900, these records antedating its discovery in Peru.

Details are given of the distribution of avocado scab (*S. perseae*) in Brazil [ibid., xiv, p. 459], where the disease has spread rapidly since its introduction ten years ago. *E. veneta* on raspberry and *E. piri* on apple and pear [ibid., xiv, p. 223; xviii, p. 478] have only been observed in the Argentine, but rose anthracnose (*S. rosarum*) [ibid., xvii, pp. 69, 683], already known in both these countries, was also collected by A. S. Müller in Venezuela in 1937.

Specimens of *E. calopogonii* on *Calopogonium coeruleum* from other districts of Peru besides the locality providing the type species have recently been identified by Sydow.

The present position as regards the distribution of sour and sweet orange scab (*E. fawcetti* and *E. australis*) in South America [ibid., xvii, p. 595 *et passim*] is reviewed and the literature relating to these diseases critically discussed. Both fungi are present in Brazil, the Argentine, and Paraguay [ibid., xvii, p. 389], while *E. fawcetti* also occurs in Venezuela and *E. australis* in Uruguay, the hosts of the former including (besides the sour orange) sweet orange, *Citrus sinensis* × *C. nobilis*, *C. nobilis* var. *unshiu*, lemons, limes, pomelo, tangelo (*C. grandis* [*C. maxima*] × *C. nobilis*), and calamondin (*C. mitis*), and those of the latter (in addition to the sweet orange) tangerine, *C. nobilis* × *C. sinensis*, limes, *C. hystrix*, *Fortunella margarita*, *C. nobilis* × *C. paradisi*, *C. paradisi*, and *C. nobilis unshiu*.

A survey of the history of grape anthracnose (*E. ampelina*) in South America shows that the disease engaged the attention of viticulturists in Brazil [ibid., xvii, pp. 17, 726], the Argentine, Paraguay, and Chile, and possibly also in Uruguay, as early as 1881 to 1900, before the establishment of phytopathological laboratories in some cases.

S. terminaliae on *Terminalis catappa* has been reported from another locality in Brazil (Rio de Janeiro) in addition to the original record from São Paulo [ibid., xvii, p. 348]. *S. mattirolianum* on *Arbutus unedo* [ibid., xii, p. 661] is still known only from the Argentine, where it was discovered in 1931, but an atypical form of anthracnose of *Genipa americana* (*S. genipae*), previously observed in São Paulo [ibid., xvii, p. 349], has been reported from the Rio Grande del Norte, Brazil.

Five of the pathogens under discussion (*E. australis*, *E. amazonica*, *E. calopogonii*, *S. terminaliae*, and *S. genipae*) were first described from South America and of these all except *E. amazonica* are confined to it.

The quarantine measures that have been established to combat these diseases indicate the recognition of their economic importance and of the need for restricting their spread.

Pilát (A.). **Basidiomycetes chinenses a cel. Emilio Licentio in itineribus per Chinam septentrionalem annis 1914–1936 susceptis, lecti.** [Chinese Basidiomycetes collected by the Rev. Emil Licent in the course of his journeys through northern China undertaken during the years 1914 to 1936.]—*Ann. mycol., Berl.*, xxxviii, 1, pp. 61–82, 4 pl., 3 figs., 1940.

This is a critically annotated list of some 130 northern Chinese Basidiomycetes (including 75 Polyporaceae) collected by the Rev. E. Licent during the period from 1914 to 1936.

Guyot (A. L.). **Études experimentales sur les Urédinées hétéroïques realisées au laboratoire de botanique de l'École Nationale d'Agriculture de Grignon (Seine-et-Oise) au cours des années 1938–1939.** [Experimental studies on the heteroecious Uredineae carried out in the botanical laboratory of the National School of Agriculture of Grignon (Seine-et-Oise) during the years 1938–1939.]—*Ann. Éc. Agric. Grignon*, Sér. 3, i (*1938–1939*), pp. 58–68, 1939.

On 18th March, 1938, the author placed straw of *Melica ciliata* which had become infected by *Uromyces graminis* during the summer of 1937 in the Mediterranean region of France in contact with young plants of *Anethum foeniculum* [*Foeniculum vulgare*]. The first spermogonia appeared on 21st April, 1938, and a few mature aecidia were noted on 20th May. This result confirms the ability of *F. vulgare* to carry the aecidia of *U. graminis* in the locality mentioned.

In the course of an experimental study on the relation of the aecidia on *Euphorbia gerardiana* to *U. caryophyllinus* it was found that aecidiospores from the north of France and the vicinity of Paris were able to develop on a number of species of *Dianthus* (actively on *D. prolifer* and *D. sinensis*, moderately on *D. barbatus* and *D. deltoides*, and weakly on *D. monspessulanus* and *D. seguieri*), but there are many species of *Dianthus*, including the carnation (*D. caryophyllus*), which they appear to be unable to infect.

Artificial inoculations with aecidiospores of *U. pisi* taken from *Euphorbia cyparissias* [*R.A.M.*, xvii, p. 478] in various parts of northern France and of *U. fischeri-eduardi* from *E. cyparissias* [ibid., xv, p. 607] showed differences in the susceptibilities of various leguminous hosts to several strains of the rusts.

Van Beyma Thoe Kingma (F. H.). **Ueber einige Formen von Verticillium dahliae Klebahn.** [On some forms of *Verticillium dahliae* Klebahn.]—*Antonie van Leeuwenhoek*, vi, 1, pp. 34–47, 3 figs., 1940.

At the Centraalbureau voor Schimmelcultures, Baarn, the writer studied a number of pure cultures of *Verticillium* isolated from damp packing material at the Unilever Bacteriological Laboratory, Rotterdam, in comparison with the related *V. albo-atrum* Reinke & Berthold, *V. amaranti* Verona & Ceccarelli [*R.A.M.*, xiv, p. 765], *V. dahliae* Klebahn, *V. ovatum* Berkeley & Jackson [ibid., v, p. 564], and *V. tracheiphilum* Curzi [ibid., v, p. 206].

Wollenweber's opinion that *V. albo-atrum* is a widespread pathogen of a number of hosts [ibid., ix, p. 6] cannot be sustained on the basis of these investigations, which, on the contrary, stamp it as a rare parasite, mostly confined to potato and tomato. *V. dahliae*, on the other hand, is prevalent in nature on a wide range of hosts and comprises a variety of forms, including three new ones herein described [with Latin diagnoses] in addition to those previously assigned by Wollenweber to *V. albo-atrum* and now transferred to *V. dahliae* as new combinations. *V. albo-atrum* and *V. dahliae* differ markedly in cultural characters as well as in distribution, the former producing only a white, later dark-coloured resting mycelium tending to thicken into black knots without pseudosclerotia or chlamydospores, while the latter forms an abundance of chlamydospores, sometimes developing into pseudosclerotia, and its conidiophores, unlike those of *V. albo-atrum*, do not turn brown at the base. Species of *Verticillium* are clearly differentiated from those of *Cephalosporium* by their verticillate conidiophores, and therefore *C. serrae* [ibid., ix, p. 594] is transferred to *Verticillium* as *V. serrae* (Maffei) van Beyma n. comb. *V. dahliae* is envisaged as a 'group species' comprising a number of types and forms not entitled to specific rank. On this basis Wollenweber's varieties of *V. albo-atrum* are converted into forms of *V. dahliae*, *V. albo-atrum* Reinke & Berthold var. *chlamydosporale* Wr [ibid., ix, p. 6], becoming *V. dahliae* Kleb. f. *chlamydosporale* (Wr) van Beyma n. comb.; and *V. albo-atrum* var. *chlamydosporale* f. *angustum* Wr and *V. albo-atrum* var. *medium* Wr [loc. cit.] being changed into *V. dahliae* Kleb. f. *angustum* (Wr) van Beyma n. comb. and *V. dahliae* Kleb. f. *medium* (Wr) van Beyma n. comb., respectively. In agreement with G. H. Berkeley *et al.* [ibid., xi, p. 130], *V. albo-atrum* var. *caespitosum* Wr [ibid., ix, p. 6] is understood to be merely a variant of *V. albo-atrum* forming no pseudosclerotia in contradistinction to *V. dahliae*. *V. amaranti* forms intercalary chains of chlamydospores, like the *V. dahliae* group; it is identical with *V. serrae*. *V. tracheiphilum* and *V. ovatum* are stated to be identical with *V. dahliae*. *V. cinerescens* Wr [loc. cit.] is excluded from the genus *Verticillium* by reason of its fasciculate conidiophores and is placed in *Phialophora* as *P. cinerescens* (Wr) van Beyma n. comb.

The above-mentioned three new forms of *V. dahliae* are characterized by the following peculiarities: f. *zonatum* by the rapid production of chlamydospores which soon turn dark brown, and by the formation of well-defined zones in oatmeal and potato agar cultures; f. *cerebriforme* by its cerebriform colonies on beer wort agar and the development of chlamydospores in long chains; and f. *restrictum* by its cream-coloured, later faintly greyish-green colonies on beer wort agar and its circular to subglobose conidia, 3 to 3·3 by 2·3 to 2·7 μ.

TUNSTALL (A. C.). **Notes on root diseases of Tea in north east India.**—*Mem. Tocklai Exp. Sta. Indian Tea Ass.* 8, 25 pp., 11 pl. (6 col.), 1940.

The main object of this paper is stated to be to help planters in north-eastern India to distinguish root diseases of tea caused directly by a parasitic fungus from those in which the organism is secondary. Only two diseases of each group are described in detail, charcoal stump rot (*Ustulina zonata*) and brown root rot (*Fomes lamaoensis*) [*R.A.M.*,

x, p. 345] representing the first type, and violet root rot (*Sphaerostilbe repens*) [ibid., xvi, p. 1] and *Diplodia* or internal root disease (*Botryodiplodia theobromae*) the second [but see ibid., xvii, p. 71]. Practical recommendations are made for the control of both groups of disorders, in connexion with which it may be mentioned that the encirclement of diseased trees with shallow isolation trenches is no longer advocated, the removal of infected material being regarded as the sole reliable treatment.

Notes are also given on the following fungi associated with root rots in a primary (A) or secondary (B) capacity: A. Black root rot (*Rosellinia arcuata*) [ibid., xv, p. 610], *Kretzschmaria micropus*, a pathogen of rare occurrence, probably an aberrant form of *U. zonata* [ibid., viii, p. 611], *Hypoxylon asarcodes*, hitherto recorded only on a few specimens from the Jalpaiguri district and on one from the Assam Valley, *Armillaria mellea*, seldom observed locally, *Fomes lucidus* [*Ganoderma lucidum*], also uncommon in the north-east, red root rot (*Poria hypolateritia*), and *Helicobasidium compactum* [ibid., xii, p. 9], occasionally found attacking plants under five years old. B. An unidentified species of *Aglaospora*, distinct from *A. aculeata* [ibid., x, pp. 79, 760], *Rhizoctonia bataticola* [*Macrophomina phaseoli*: ibid., xiv, p. 561; xvii, p. 301], undetermined *R.* spp., one of which is associated with a stringy type of mycorrhiza peculiar to the Darjeeling district, *Auricularia auriculajudae* [ibid., vi, p. 127], *F. applanatus* [*G. applanatum*], *F. lignosus*, *P. hypobrunnea*, *Irpex destruens* [ibid., xii, p. 597], *I. subvinosus* [ibid., iii, p. 5], *Polyporus interruptus*, and *P. mesotalpae*, the four last-named occurring only sporadically in the north-east.

A key is given of the principal symptoms caused by the various fungi to assist diagnoses from an examination of the roots of dead bushes.

Bitancourt (A. A.) & Jenkins (Anna E.). **«Elsinoë theae n. sp.», agente da verrugose da Chá.** [*Elsinoe theae* n. sp., the agent of Tea scab.]—*Arq. Inst. biol. S. Paulo*, x, pp. 193–198, 2 pl., 1939. [English summary.]

Portuguese and Latin diagnoses are given of *Elsinoe theae* n. sp., the agent of a foliar scab of tea at Cantareira, São Paulo, Brazil, and also in Ceylon, where specimens were collected by T. Petch in 1917 and 1922 and by C. H. Gadd in 1939; the former described the symptoms in his 'Diseases of the Tea Bush' [*R.A.M.*, iii, p. 3] under the name of 'scabbed leaves'. The fungus, which forms on the leaves (mostly on the upper side) round, black, often confluent spots, 0·2 mm. in diameter, is characterized by pulvinate, intra-epidermal, pseudoparenchymatous ascomata, 200 to 300 by 15 to 18 μ; by asci usually forming an irregular single stratum, sometimes with thickened stalks or apices, 14 to 22 by 12 to 20 μ, containing eight hyaline, triseptate ascospores, the middle cells longitudinally septate and constricted in the centre, the upper and lower ones broader and shorter; and by numerous spherical, hyaline microconidia, 0·5 to 1 μ in diameter. On potato dextrose agar the fungus grows slowly, producing compact, convoluted, salient, cinnamon-coloured colonies which gradually assume a concentric aspect, the central zone being of a fawn tint, the next orange-cinnamon, and the peripheral army-brown.

TAKAHASHI (W. N.). **An attempt to propagate Tobacco mosaic virus 1 in the chorio-allantoic membrane of the developing chick embryo.**—*Phytopathology*, xxx, 2, pp. 184–185, 1940.

The writer's attempts to propagate tobacco mosaic virus 1 in the chorio-allantoic membrane of the developing chick, a favourable medium for animal viruses, gave entirely negative results.

KAUSCHE (G. A.) & RUSKA (H.). **Die Struktur der „kristallinen Aggregate" des Tabakmosaikvirusproteins.** [The structure of the 'crystalline aggregates' of the Tobacco mosaic virus protein.]—*Biochem. Z.*, cccliii, 3–4, pp. 221–230, 6 figs., 1939.

It was concluded from studies with the Siemens ultramicroscope on an ammonium sulphate precipitate of tobacco mosaic virus protein that the crystal-like needle structures must be designated paracrystalline aggregates of crystalline molecules [*R.A.M.*, xviii, p. 44].

PRICE (W. C.). **Thermal inactivation rates of four plant viruses.**—*Arch. ges. Virusforsch.*, i, 3, pp. 373–386, 2 graphs, 1940.

Thermal inactivation of the tobacco necrosis, tobacco mosaic, lucerne mosaic, and tobacco ring spot viruses was found to follow the course of a first order reaction. The rates of inactivation, judged by infectivity on Black cowpeas for tobacco necrosis and ring spot, Early Golden Cluster beans (*Phaseolus vulgaris*) for lucerne mosaic, and *Nicotiana glutinosa* for tobacco mosaic, at a number of different temperatures were calculated for each of the four viruses, and the energy of activation (*E*) values computed from the resultant data in calories per mole. They were as follows: tobacco necrosis at 70° to 95° C., 37,300; tobacco mosaic in undiluted juice at 68° to 84° and 84° to 95°, 55,300 and 195,000, respectively; diluted 1 : 20 at 68° to 83° and 83° to 91°, 92,000 and 176,000, respectively; in dried White Burley leaf material at 70° to 150°, 24,100; lucerne mosaic at 50° to 62·5°, 75,000; and tobacco ring spot at 45° to 56·5° and 56·5° to 65°, 78,800 and 27,600, respectively.

GOWEN (J. W.). **The size of the Tobacco mosaic particle from X-ray determinations.**—*Proc. nat. Acad. Sci., Wash.*, xxvi, 1, pp. 8–10, 3 graphs, 1940.

The evidence obtained from experiments in which the tobacco mosaic virus was exposed to X-rays indicated that the virus has a somewhat large molecule of 16 to 20 millions in molecular weight [*R.A.M.*, xviii, p. 763].

SILBERSCHMIDT (K.) & KRAMER (M.). **A disseminação do mosaico do Fumo no campo.** [The dissemination of Tobacco mosaic in the field.]—*Arq. Inst. biol. S. Paulo*, x, pp. 61–72, 1 pl., 1 diag., 1 graph, 1939. [German summary.]

In 1938 three experimental plots, laid down at different levels at a distance of 10 m. apart, were each planted with 100 Virginia tobacco seedlings, the two rows of the highest alternating with two of 51 plants each of *Solanum reflexum*, artificially inoculated with mosaic [*R.A.M.*, xviii, p. 632], the intermediate being similarly arranged except for the omission of inoculation, and the lowest left with the tobacco only.

Infection spread in the first plot alone, the incidence on the tobacco increasing from 2·12 per cent. on 7th April to 12·76 on 28th July in a more or less uniform manner. The height, stem diameter, and number of fruits in a healthy and a diseased plant of *S. reflexum* were 0·87 m., 0·014 m., and 26, and 0·47 m., 0·007 m., and 4, respectively. The dissemination of the disease was evidently not materially furthered by flying insects, since the two other plots, only a short distance away, were not involved. It would appear from these results that the eradication of Solanaceous weeds from the vicinity of tobacco plantations is superfluous, though it is advisable to remove them, especially if infected, from the fields themselves.

Johnson (J.) & Ogden (W. B.). **Tobacco mosaic and its control.**—*Bull. Wis. agric. Exp. Sta.* 445, 22 pp., 8 figs., 1939. [Received April, 1940.]

An account is given in semi-popular terms of the symptoms, cause, losses due to, manner of spread, and control of tobacco mosaic. In Wisconsin the most usual and the most important source of infection is the planting of tobacco on land on which an infected crop was grown the previous year. If the percentage of mosaic in any field is high, and other suitable land is available, a change should be made. Tobacco refuse should not be used as seed-bed fertilizer or for insecticidal purposes. All seed should be free from chaff. The ploughing-under of refuse is useless, and tobacco trash should not be used as a field fertilizer unless allowed to decay on the land for five to six months before the crop is planted. With regard to the use of tobacco by workers in the crop, it is pointed out that the use of unmanufactured leaf is most likely to set up infection, since it may contain more virus than the manufactured product, and is often handled more carelessly. The percentage of mosaic resulting from the use of manufactured tobacco by workers is very low in comparison with that due to infested soil, but such use may cause a limited amount of infection, which can, however, be obviated by avoiding all use of tobacco when handling the plants, or by resorting to tobacco that has been sterilized for 15 minutes at least in 'dry' steam or hot air. Seed-beds should be not situated near the tobacco sheds, and frames, covers, and tools should not be stored in the sheds. The roguing of small percentages of diseased plants from the field early in the season is advisable, if tobacco has not been grown on the land for two years or more, but roguing is not practicable on old infected land. Spread in the field can be much reduced by handling diseased and healthy plants separately during field operations, especially topping. In conclusion, it is pointed out that control measures must be adapted to suit the requirements of each particular farm: there are no hard-and-fast rules equally applicable to all conditions.

Bonnemaison (L.). **La maladie bronzée de la Tomate.** [Spotted wilt of Tomato.]—*Ann. Épiphyt.*, N.S., v, 3, pp. 268–308, 21 figs., 1 graph, 1939.

In this paper the author reviews and discusses the information at present available on the 'maladie bronzée' or spotted wilt of tomato

and its insect vector *Thrips tabaci*. [The bibliography comprises over 90 items.] Investigations (mainly entomological) carried out on the subject near Bordeaux in 1936–7 and in the vicinity of Lyons in 1938 are also described [cf. *R.A.M.*, xviii, p. 65].

The disease was observed in the departments of Gironde, Dordogne, Rhône, Isère, and Nord, and is therefore probably present in most parts of France. The symptoms [which are described] observed on naturally infected tomato, tobacco, *Dahlia*, *Zinnia*, and China aster [*Callistephus chinensis*] in the south-west differed somewhat from those noted in the south-east, presumably owing to climatic and environmental differences in the two localities. It was concluded that the rapidity with which the symptoms appear on tomato plants depends on the growth rate of the plant, young plants being much more susceptible than older ones to the effects of the virus.

Chamberlain (E. E.). **A streak disease of Tomatoes in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxi, 5, pp. 266–271, 3 figs., 1940.

Tomato streak, first recorded in New Zealand in 1922, has been observed during the past seven years in the Auckland, Poverty Bay, Wellington, Nelson, and other districts, causing losses of 15 to 20 and up to over 50 per cent. in the field and under glass, respectively. All attempts to transmit the disease from infected to healthy tomatoes have resulted in the exclusive development of tobacco mosaic symptoms, suggesting that the agent of streak in the Dominion is either tobacco mosaic or a mixed virus, one component of which is tobacco mosaic and the other a virus not transmissible by artificial inoculation [cf. *R.A.M.*, xvi, p. 348; xvii, p. 77].

Marchionatto (J. B.). **Argentine Republic : the 'mancha bacteriana' of the Tomato.**—*Int. Bull. Pl. Prot.*, xiv, 2, p. 25, 1940.

Investigations by Lydia S. Spaini are stated to have shown that bacterial spot of tomato in the Argentine is due to *Bacterium vesicatorium*, inoculations with which on the leaves, stems, and fruits of the host resulted in the typical symptoms of the disease, namely small, dark green, water-soaked, circular, yellow-bordered spots on the foliage, and green or brown, dark-edged blotches on the fruits.

Young (P. A.), Harrison (A. L.), & Altstatt (G. E.). **Common diseases of Tomatoes.**—*Circ. Tex. agric. Exp. Sta.* 86, 32 pp., 16 figs., 1940.

Popular notes are given on the symptoms and control of the most prevalent and injurious diseases of tomatoes in Texas, with sections on control measures against tomato diseases in general, the preparation of Bordeaux mixture, and rules to be observed when spraying.

Hemmi (T.) & Akai (S.). **Pathological studies on Polyporus rhodophaeus Lév.**—*Ann. phytopath. Soc. Japan*, ix, 4, pp. 199–210, 1 pl., 3 figs., 1939. [Japanese, with English summary.]

A list is given of broad-leaved species of trees which in Japan act as the hosts of *Polyporus rhodophaeus*, stated to have been referred to by some workers as *P. semilaccatus* [*R.A.M.*, viii, p. 267]. The fungus

has been reported to occur most commonly on various species of cherry in Japan, where, from the authors' observations, *Robinia pseud-acacia* would appear to be one of the most susceptible hosts. In this host, decay due to the fungus begins in the sapwood and spreads inwards causing peripheral rot, but sometimes in a very irregular way, the central portion of the heartwood being attacked, while sound tissues remain in the outer portion. The fungus is classified in the 'corrosion' group [ibid., vii, p. 68]; in culture it grows at (approximately) 11° to 40° C., the optimum temperature for mycelial growth being about 31° to 32°.

ANKOUDINOFF (A. M.). Сердцевинная гниль Осины. [Heart rot of Aspen.]—*Лесное Хозяйство* [*Forest Husbandry*], *1939*, 8, pp. 43–49, 4 figs., 1939.

In a study on the heart rot of aspen caused by *Fomes igniarius* [*R.A.M.*, x, p. 416; xvii, p. 214], conducted during 1937–8 in the U.S.S.R., special attention was given to the red (pink to purple-brown) discoloration of the heart which usually occurs to a small extent during the first year of growth, but within five years is encountered in every tree of the stand, affecting over 70 per cent. of the stem length. True heart rot, on the other hand, is not observed at all in trees under five years old, and only in individual trees from 5 to 23. Isolations from 234 samples of discoloured aspen wood of all ages in no case yielded *F. igniarius*; 129 samples yielded sterile cultures, and 91 several saprophytic fungi, including *Verticillium* spp., particularly one resembling *V. robustum*, *Sclerotium* spp., *Torulaspora*, *Macrosporium* sp., and *Tremella* sp. Following artificial infection with *F. igniarius* wood of felled aspen developed heart rot rapidly (after six months) and that of growing aspen slowly (after three years), but in neither case did the red discoloration develop. It is concluded that this condition is not due to parasitic fungal attack and does not, as previously suggested, represent the first stage of heart rot. The main factor causing red discoloration in aspens up to three years old appeared to be mechanical injury to the stems, caused either by men, saprophytic fungi, or insects, and in older ones the unhealed dead twigs. Essential for the control of both this disorder and heart rot proper is the choice of a suitable, preferably low-lying site with a rich, not sandy soil with a plentiful supply of ground water, good care of the stands, avoiding mechanical injury to the stems, removal of injured trees and sources of infection in young stands, thinning in older ones, and pruning of dead twigs.

MILLER (P. W.). **Further studies on the comparative efficacy of Bordeaux mixture, copper oxalate, and some other 'insoluble' copper sprays for the control of Walnut blight.**—*Rep. Ore. St. hort. Soc., 1939*, pp. 127–134, 1940.

In further efforts to find a copper spray as effective as Bordeaux mixture in controlling walnut blight (*Phytomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, xviii, p. 423] and yet not injurious to foliage, tests were conducted in Oregon in 1939 with various water-insoluble copper materials. Copper oxalate was highly effective provided it was used at a sufficiently strong concentration and the spray applications were

properly timed and thoroughly applied (the few notably unsatisfactory results were found to be due to one or all of these conditions being disregarded). Three applications of pure copper oxalate (40 per cent. copper) used at the rate of 3 lb. to 100 gals. of water reduced the amount of infected nuts from 44·9 to 1·4 per cent., while an impure sample (19 per cent. copper) used at the same rate reduced it to 4 per cent. Under conditions of moderately severe to severe infection the more economical impure oxalate was less effective at 3 lb. than at 4 lb. to 100 gals., the former reducing the incidence of infected nuts from 36·2 to 11·9 per cent. and the latter to 0·9 per cent. Three applications of a dust composed of 20 parts of copper oxalate, 67 of talc, 10 of diatomaceous earth, and 3 of 'vatsol' wetter, gave the best control of any dust used up to the present time (reducing the amount of infected nuts from 47·8 to 7·5 per cent.), but were not as effective as 6–2–100 Bordeaux mixture (which reduced it to 1·4 per cent.). Good control and no foliar injury resulted from the use of yellow cuprous oxide, 45 per cent. copper oxychloride, and copper acetonate, all at the rate of 3 lb. to 100 gals. Poor to fair control was obtained with zinc ammoniacal copper silicate at 3 lb. to 100 gals., and brown cupric oxide and a proprietary copper fungicide (35 per cent. copper) both at 4 lb. to 100 gals., although all three materials were non-injurious to the foliage.

Geneaux (C. M.) & Kuenzel (J. G.). **Defects which reduce quality and yield of Oak-Hickory stands in southeastern Iowa.**—*Res. Bull. Ia agric. Exp. Sta.* 269, pp. 408–444, 12 figs., 1 map, 1939.

Most of the basal decay in oaks (chiefly white) in the forests of southeastern Iowa was found to be due to *Stereum gausapatum* [*R.A.M.*, xix, p. 245]. Sapwood rot of the same host was caused by *Strumella coryneoidea* [ibid., xiii, p. 605], apparently a new record for the State. The principal agent of oak branch stub decay was *Poria andersonii* [ibid., xvi, p. 505]. *Auricularia auricula-judae* was isolated from the rotted heartwood of three living black walnut [*Juglans nigra*] trees, but its etiological implication has not yet been established. *Nummularia* sp. was obtained only once from decayed red oak sapwood, but its characteristic encrusted lesions were observed on dead red, black, and shingle [*Quercus imbricaria*] oaks, and hickory, as well as on some moribund trees, indicating its possible involvement as a contributory cause of death.

Crowell (I. H.). **New species of Gymnosporangium.**—*Canad. J. Res.*, Sect. C, xviii, 1, pp. 10–12, 1 fig., 1940.

Descriptions [with Latin diagnoses] are given of three new species of *Gymnosporangium*. *G. minus*, described from the teleuto stage only, was collected on *Cupressus sempervirens* near Athens, Greece, and is stated to be the only species of *G.* recorded from Europe as forming its teleuto stage on a host other than *Juniperus*. The teleutosori are caulicolous, pulvinate, yellowish-brown or chestnut, and the teleutospores are ellipsoidal, usually uni-, rarely non-septate, 45·5 to 59·5 by 17·5 to 24·5 μ, with two germination pores near the septum, and with a short hyaline pedicel; the teleutospores are narrower and considerably longer and more rotund terminally than those of *G. sabinae*. *G. guate-*

malianum was found forming spermogonia and aecidia on leaves of *Amelanchier nervosa* in Parramos, Guatemala, and *G. meridissimum* forming teleutospores on twigs of *C. benthami* in two localities in Guatemala. The teleutosori of *G. meridissimum* are caulicolous, pulvinate, yellowish-brown or chestnut, and the teleutospores are ellipsoidal with a median septum, 48 to 60 by 24 to 28 μ, with two germination pores near the septum or one near the septum and one near the apex, and with a long, hyaline pedicel. This is the only species of *Gymnosporangium* on a non-*Juniperus* teleuto host known to form rotund galls. *G. guatemalianum* and *G. meridissimum* are possibly different stages of the same species. The Guatemalan stations for these species are the most southerly records of *Gymnosporangium* and all the hosts are new for the genus.

Liebster (G.). **Baumschulverluste durch den Kiefernnadelblasenrost.** [Tree nursery losses from Pine needle blister rust.]—*Blumen- u. PflBau ver. Gartenwelt*, xliii, 52, pp. 556–557, 3 figs., 1939.

The recrudescence in a severe form of pine needle blister rust (*Coleosporium* [spp.]) in a north-west German nursery [*R.A.M.*, viii, p. 344] in 1939 after a long period of quiescence (since 1923 in the Chorin forest range, the previous record dating back to 1879 in Moravia) indicates that the disease may assume practical importance from time to time. Three- to ten-year-old trees of *Pinus sylvestris*, *P. montana*, and *P.* [*nigra* var.] *austriaca* are the preferred hosts, though infection may occur on those of all ages up to about 30 years. The life-history of the rust is briefly outlined in semi-popular terms. Its alternate hosts include a number of weeds commonly found in meadows or gardens adjoining the nurseries, e.g., species of *Senecio*, *Sonchus*, *Inula*, *Tussilago*, *Petasites*, *Adenostyles*, *Campanula*, *Melampyrum*, *Euphrasia*, and *Alectorolophus*, the eradication of which therefore constitutes the first line of attack against the parasite.

Buchanan (T. S.). **Needle-bearing internodes on Western White Pine reproduction in relation to blister rust infection.**—*J. For.*, xxxviii, 1, pp. 52–54, 1 graph, 1940.

It has been definitely ascertained that the current season's shoots of western white pine (*Pinus monticola*) are relatively resistant to blister rust (*Cronartium ribicola*) [*R.A.M.*, xviii, p. 216]. In order to obtain information as to the proportion of the target of infection presented by this material, 24 trees, 4 to 19 years old, were selected for study in the St. Joe National Forest, Idaho. Assuming characteristic needle retention, it was found that the current season's growth presented a blister rust target which rarely exceeded that of one-year-old needles by 2½ times, and that only on two- to four-year-old trees. The usual ratio of current season's to one-year-old growth for 5- to 19-year-old-trees was somewhat less than 1·5 : 1.

Gavris (V. P.). Селекционный отбор иммунных форм Сосны обыкновенной. [Selection of immune forms of common Pine.]—*Лесное Хозяйство* [*Forest Husbandry*], *1939*, 8, pp. 5–8, 1939.

Following the droughts of recent years, 2- to 12-year-old planted and

self-sown pines in the Nicolo-Polomsk forest station [U.S.S.R.] suffered during 1937–8 from severe attacks of *Melampsora pinitorqua* [*R.A.M.*, xix, p. 54]. Most of the two- to three-year-old seedlings perished and 90 to 95 per cent. of the young self-sown pines were infected. Investigations showed that the weight of 1,000 seeds varied in different strains of pine from 3·5 to 8 gm. and was a constant character for each strain over a period of years. A survey of seedlings grown from seeds from eight different trees showed a rough correlation between heavy seeds and resistance, the maximum number of diseased seedlings, 44 per cent., corresponding to a weight of 4·1 gm. per 1,000 seeds, and the minimum, 9 per cent., to that of 5·7 gm. It is concluded that strains of pine with a seed-weight of about 6 gm. per 1,000 seeds or above are the most resistant, and the existence of resistant strains being thus indicated it is suggested that further work should lead to the selection of strains immune from the disease.

García (L. A. A.). **A Cedar seedling blight in Puerto Rico.**—*Caribb. Forester*, i, 2, p. 26, 1940. [Spanish summary. Mimeographed.]

In February, 1937, *Cedrela mexicana* seedlings near Luquillo, Puerto Rico, were severely attacked by *Phyllachora balansae*, the conidial stage of which is a species of *Linochora*. The yellowish-brown, mostly ill-defined spots on the leaves, up to 25 mm. in diameter, give rise on both sides, especially the upper, to between 50 and 100 minute, erumpent, black, gregarious fruit bodies. In severe cases the foliage turns yellow and is shed, the plants eventually dying. Petioles and young twigs are also liable to infection.

Findlay (W. P. K.), Birkinshaw (J. H.), & Webb (R. A.). **Food group-microbiological panel. Investigations of the wood-rotting fungi. Biological methods. Chemical methods.**—*Chemistry & Industry* (formerly *J. Soc. Chem. Ind., Lond.*), lix, 6, pp. 95–96, 1940.

W. P. K. Findlay, discussing biological methods of investigating wood-destroying fungi, states that two types of metabolic products synthesized by these organisms have been studied, namely, aromatic substances and organic acids. Many pathogens of wood produce highly characteristic aromatic odours enabling them to be recognized in culture [*R.A.M.*, xix, p. 213]. Particularly interesting in this respect is *Lentinus lepideus*, the acicular crystals on the mycelium of which appear to be associated with the smell of balsam of Peru. It is thought that the exceptionally high resistance of this fungus to creosote [ibid., xviii, p. 829] may be due to its production of methoxy derivatives of phenolic acids.

Fungi causing brown rots, with their mainly hydrolytic reactions, form larger amounts of acid than the agents of white rots, in which hydrolysis is accompanied by oxidation [ibid., xviii, p. 360], resulting in a depletion both of the lignin and cellulose contents of the wood.

The researches to date have been conducted on sterilized blocks of Scots pine [*Pinus sylvestris*] sapwood on malt agar in specially constructed Kolle flasks with a moisture reservoir in the neck, from which

samples are removed for chemical analysis after two to six months' incubation at 22° C.

J. H. Birkinshaw and R. A. Webb separated the volatile products formed by *L. lepideus* on Scots pine sapwood by steam distillation, thereby obtaining a mixture of esters, including methyl-para-methoxycinnamate, methyl cinnamate, and an unidentified ester of anisic acid. These products were absent from uninfected wood, whereas methyl-para-methoxycinnamate was formed by the growth of the fungus on malt agar.

The distillate from Scots pine sapwood rotted by *Coniophora cerebella* [*C. puteana*], extracted with cold water and evaporated *in vacuo*, contained, in addition to formic and acetic acids (also derived from sound wood), polysaccharides precipitable by alcohol, ether-soluble acids, including citric acid, and ether-insoluble acids. Citric acid, which could not be isolated from healthy material, is regarded as a metabolic product of the fungus.

The papers were followed by a discussion.

Butovitsch (V.) & Spaak (H.). **Studier och försök att skydda i skogen kvarliggande timmer mot insekter och svampar jämte beräkninga av konserveringsmetodernas ekonomiska förutsättningar.** [Studies and experiments on the protection against insects and fungi of logs left in the forest, with calculations of the profitability of the methods of preservation employed.]—*Norrlands SkogsvFörb. Tidskr., 1939*, 3, 120 pp., 1939. [German summary. Abs. in *For. Abstr.*, i, 4, pp. 278–280, 1940.]

Much of the 400,000 cu. m. of Scots pine [*Pinus sylvestris*] and Norway spruce [*Picea excelsa*] timber thrown in the forests of southern Hälsingland, central Sweden, by two storms, one in September, 1937, and the other in March, 1938, had to be left lying over the following summer, and efforts were made to protect it by (*a*) spraying the barked and unbarked logs before stacking with 15 or 20 per cent. carbokrimp carbolineum, a fungicide known as rustikol (undiluted), and several solutions of various arsenical salts, the stacked logs being covered on all sides with a layer of spruce slash or moss, and (*b*) storing the unbarked material in a trench in wet peat soil and covering with a sphagnum layer to a depth of 20 to 30 cm. Examination in October, 1938, revealed a fairly close correlation between insect depredations and [unspecified] fungal sap stain, *Hylastes cunicularius* in particular being associated with extensive discoloration of spruce. The extent of sap stain was much reduced by shading but if the slash covering afforded efficient protection against drying out, shading had no effect. Of the chemical preservatives tested, only rustikol was of any fungicidal value; the arsenical preparations not only failed to control, but even appeared to stimulate, the development of sap stain. On the other hand, storage in wet peat was effective, due to a heavy increase in the moisture content of the logs. In the case of unbarked sawn timber, top logs were more severely damaged than unbarked butt ones by rot fungi [unidentified]; in barked logs there was no significant difference. In contrast to the sap-staining fungi the rot fungi were less injurious to well than to poorly illuminated stacks. Spruce was more susceptible

to decay than pine, which suffered chiefly from sap stain. On the basis of the results given by the sawn boards, it is estimated that pine of the fourth quality and under will not pay for treatment, the economic limit for spruce lying somewhat higher.

GÄUMANN (E.). **Über die Temperaturansprüche des Hausschwammes.** [On the temperature requirements of the dry rot fungus.]—*Zbl. Bakt.*, Abt. 2, ci, 21–22, pp. 409–410, 1940.

The recent occurrence within the city of Zürich of intensive outbreaks of dry rot (*Merulius lacrymans*) in cellars with a maximum temperature of 10° C. suggested the possible existence of a physiologic race of the fungus capable of thriving in a colder atmosphere than that usually regarded as the optimum (18° to 22°). The optimum temperature for growth of the fungus, estimated by the diameter of 15-day-old cultures on malt agar and by the degree of destruction of spruce sapwood in eight months, was found to be 15° to 18°, while fair growth, resulting in the destruction of about 7 per cent. of the wood, was made at 0°, the minimum apparently lying at −2° instead of 3°, whereas the maximum of 24° to 27° is the same as for ordinary strains of *M. lacrymans*.

HENDERSON (F. Y.). **Timber: its properties, pests, and preservation.**—185 pp., 45 figs., 12 diags., 2 graphs, London, Crosby Lockwood & Son, 1939. 9*s*. 6*d*.

This elementary manual on timber technology contains sections on natural defects, durability, and decay, with special reference to dry rot (*Merulius lacrymans*), the cellar fungus (*Coniophora cerebella*) [*C. puteana*], staining fungi (*Ceratostomella* spp.), and on modern methods of preservation.

HUBERT (E. E.). **Toximetric method for oil-soluble wood preservatives.**—*Industr. Engng Chem.*, Analyt. Ed., xii, 3, pp. 139–141, 1940.

Detailed directions are given for the evaluation of oil-soluble wood preservatives by a method developed by members of the Preservative Standards Advisory Committee of the [United States] National Door Manufacturers' Association. The technique provides for the establishment of minimum requirements for various properties of the toxic chemical, e.g., toxicity and permanence in wood, and of the treating solution, such as concentration of toxicant, flash point, volatility, and leachability. The wood prescribed for use in the tests is kiln-dried *Pinus ponderosa* sapwood and the fungi to be used are approved strains from the Forest Products Laboratory of *Lenzites trabea* (for decay) and *Hormiscium gelatinosum* (for staining) [*R.A.M.*, xviii, p. 285].

'Ascu' wood preservative.—*Curr. Sci.*, ix, 1, p. 3, 1940.

It is announced that the Forest Research Institute [Dehra Dun] withdraws the publication entitled '"Ascu"—a wood preservative' (*Indian For. Rec.*, N.S., *Utilisation*, i, 6) [*R.A.M.*, xvii, p. 716], and will postpone its reissue in a revised form until further investigations have been completed.

Steinherz (D.). **Fluorine compounds as wood preservatives. A review of methods of application.**—*Canad. Chem. Process Industr.*, xxiii, 12, p. 601, 1939.

The author gives a valuable review of the progress made in the use of fluorine compounds in the preservation of wood from their introduction in 1861 to the present day.

Hattori (T.) & Tamura (T.). **On the effect of electricity upon the growth of wood-destroying fungi.**—*Ann. phytopath. Soc. Japan*, ix, 4, pp. 211–222, 7 figs., 1939. [Japanese, with English summary.]

When *Poria vaporaria*, *Polystictus sanguineus*, and *Schizophyllum commune* were exposed to the effects of direct, alternating, and high-frequency electric currents run through (1) a piece of wood placed on a fungal mat growing on culture medium, (2) the fungi on a culture medium, and (3) the fungi grown on a piece of wood, it was found that the current checked fungal growth and destroyed the fungi at a point where density of current was great. Direct current was more effective than alternating current, and high-frequency current had little effect. The checking effect observed is attributed to heat, the production of toxins through electrolysis, the movement of charged substances and the migration of nutritive elements, due to electro-endosmosis, and, also, destructive action. Experiments showed, however, that the first two effects were insufficient in themselves to check fungal growth. As colouring matter diffused out of the cells of *P. sanguineus*, electro-endosmosis would appear to exercise a marked effect on the growth of these fungi.

Findlay (W. K. P.) & Pettifor (C. B.). **Effect of blue stain on the strength of Obeche (Triplochiton scleroxylon).**—*Emp. For. J.*, xviii, 2, pp. 259–267, 1 pl., 1939.

A tabulated account is given of the writers' mechanical tests and chemical analyses at the Forest Products Research Laboratory, Princes Risborough, of selected samples of blue-stained obeche (*Triplochiton scleroxylon*) cut from a log freshly imported by the United Africa Company which was badly affected by blue stain (*Botryodiplodia theobromae*). This fungus has been isolated frequently from stained logs left lying about in the forest or in storage before shipment from Nigeria or the Gold Coast. One series of experiments was carried out on samples exposed under regulated conditions to infection by the fungus, and another on matched controls, half the material in each case being sterilized by intermittent steaming (45 minutes on three successive days at atmospheric pressure). Infection was found to result in a substantial reduction in toughness (amounting in one group of heavily stained specimens to 43 per cent.), a diminution of bending strength (up to 19·7 per cent.), a decline of roughly 7 per cent. in stiffness (the sterilized timber showing a negligible change), and a decrease in specific gravity (maximum 12·5 per cent.). The fungus further caused a serious depletion in the content of the wood in water-soluble substances (from 7·09 to 2·70 per cent.) and also attacked the cellulose, pentosans, and lignin in a manner typical of the 'white' group of wood-destroying fungi.

MOORE (G. E.). **Concentrations of water-soluble preservatives in treated timber.**—8 pp., 3 figs., 1 graph, Ottawa, Forest Products Laboratories, 1939. [Mimeographed.]

Analysis of sample pieces from two jack pine [*Pinus banksiana*] railway sleepers, pressure-treated in 1924 with zinc chloride at the rate of ½ lb. per cu. ft., placed on the track in 1925 and removed in 1929, showed that the average weight of zinc chloride (estimated from zinc determinations) per cu. ft. for the whole sleeper was 0·108 and 0·096 lb., respectively. Similar but more detailed analyses of eastern hemlock [*Tsuga canadensis*] sleepers receiving the same pressure treatment, placed in position in 1929 and removed in 1938, are tabulated. In one typical instance, the zinc chloride concentration, averaged over the whole sleeper, amounted to 0·089 lb. per cu. ft., as calculated from zinc determinations, and 0·021 lb. per cu. ft. as calculated from chlorine determinations. These differences are attributed to the well-known property of zinc chloride of forming basic chlorides and hydrochloric acid, of which the latter is readily leached from the wood. The data show that in four years the concentration of zinc chloride, as calculated from zinc determinations, was reduced to about 20 per cent. of its initial concentration in the jack pine and in nine years to rather less than 20 per cent. in the eastern hemlock. Variations in zinc chloride concentration in different parts of any one sleeper appeared to have little significance. In general, decay [unspecified] was confined to the spike holes and ends, little or none being found in the centre portion. No definite conclusion was reached as to the amount of zinc chloride required to inhibit decay but there were indications that a considerable proportion of this substance is lost within a few years of installation.

Aspen posts were butt-treated (after seasoning) by being placed to a depth of 2 ft. 6 in. in a 5 per cent. zinc chloride solution kept at 190° to 200° F. for one half to one hour, and left standing for 36 hours in the solution (which was allowed to cool); in the course of the treatment the posts absorbed 2 to 3¾ lb. of solution, or 0·10 to 0·18 lb. of zinc chloride. Detailed examination of one post after four years' service showed that the amount of zinc chloride present per cu. ft. (calculated from zinc determinations) at 24, 15, and 5 in. below the ground-level was 0·113, 0·143, and 0·110 lb., while at 5, 25, and 55 in. above the ground-line it was 0·305, 0·264, and 0·155 lb., the corresponding figures, based on chlorine determinations, being 0·013, 0·024, 0·021, 0·249, 0·266, and 0·170 lb. The total amount of zinc chloride in the post, based on zinc and chlorine determinations, was 0·110 and 0·090 lb., respectively. These figures indicate that service conditions not only remove water-soluble preservative from a standing post, but cause the preservative to move to parts, such as the centre above the ground, where protection is scarcely necessary. The zinc ion appears to be more stable than the chlorine ion, and while the zinc moved upwards in appreciable quantities, chloride in more than equivalent amounts was lost from below ground-level, or moved upwards. In 64 posts treated with zinc chloride and kept in service for 12 years only slight decay was found below ground-level, and only one replacement had been necessary, the small amount of zinc chloride remaining in the butts having increased their service life.

Examination of two aspen posts, the butts of which had been steeped in copper sulphate solution for 6 to 8 hours, showed that most of the salt was concentrated in a quarter-inch outside shell extending almost the whole length of one pole and less than half the length in the other, a phenomenon which cannot be readily explained.

Sempio (C.). **Secondo contributo alla conoscenza dell' azione esercitata da vari fattori ambientali su alcune malattie parasitarie di piante coltivate ('ruggine bianca del Ravanello').** [A second contribution to the knowledge of the action exercised by various environmental factors on some parasitic diseases of cultivated plants ('white rust of Radish').]—*Riv. Pat. veg.*, xxx, 1–2, pp. 29–64, 2 pl., 13 graphs, 1940.

Further experiments, on the same lines as those previously described [*R.A.M.*, xviii, p. 471], carried out to ascertain the effects of various environmental conditions on infection of red radish by *Cystopus candidus* during the three main phases of infection [one to three, four to seven, and seven to ten days after inoculation: loc. cit.] showed that the temperature most favourable to infection was approximately 16° to 18° C., though the disease developed readily at 12° to 21°. The lowest and highest temperatures at which infection occurred were, respectively, 6° to 7° and 28° to 29°. Above 24° the effects of temperature were most marked in the third phase (which is considered to be a critical one for the host-parasite complex), there being a reduction in the intensity of attack and delay in the appearance of the symptoms. The second phase was the least affected by high temperatures, while the first was intermediate and less constant in this respect.

When inoculated plants were subjected to relative humidities of 98 to 100 per cent., final infection was generally less severe than in plants kept in relative humidities of 60 to 80 per cent.; evidence was obtained that high humidity was most unfavourable to the second and third phases.

When infected plants were kept in darkness during the first period the disease was usually stimulated as compared with the controls, but during the third period exposure to darkness constantly reduced infection. The second period was intermediate in this respect.

The second phase was the least affected by exposure to carbon dioxide but the most sensitive to ultra-violet rays while the third phase exhibited the opposite reactions to these two agents.

Kanivetz (I. I.). Роль гриба **Trichoderma lignorum** и корневых систем Сахарной Свеклы, озимой Пшеницы, Овса, Люпина и Клевера в создании почв с прочной структурой. [Role of the fungus *Trichoderma lignorum* and the root systems of Sugar Beet, winter Wheat, Oats, Lupin, and Clover in the consolidation of soils.]—*ex* Сборник научно-исследовательских работ ВНИС, Госуд. Издат. колх.-совх. Литер. УССР [Collection of scientific research papers of the Pan-Soviet Scientific Research Institute for the Sugar Beet Industry, State Publ. Off. Lit. coll. co-op. Fmg Ukraine], pp. 136–172, 8 figs., 1939.

Beregovaya (Mme M. M.). О методике искусственного заражения высадков Сахарной Свеклы в связи с селекцией на устойчивость

к церкоспоре. [On methods of artificial infection of Sugar Beet seedlings in selection tests for resistance to *Cercospora*]—ibid., pp. 302–308, 4 figs., 1939.

In the first paper the author states that the aggregation of soil particles was found to be greater in rhizospheres of winter wheat, oats, sugar beet, lupin, and clover than in the surrounding soil. In fields of winter wheat, oats, and sugar beet, foci were observed in which such aggregation was three or four times greater than in the surrounding soil, the phenomenon being attributed to the presence of manure or compost, or the activity of earthworms or micro-organisms [*R.A.M.*, xviii, p. 817; xix, p. 115], particularly *Trichoderma lignorum* [*T. viride*: ibid., xviii, p. 761]. Artificial infection of soil with *T. viride* (in the case of sugar beet also with *Aspergillus niger* and *Azotobacter*) resulted in an increase in soil aggregation in the rhizospheres of winter wheat, oats, lupin, and sugar beet of 126·2, 161·8, 39·9, and 12·5 per cent., respectively. Chemical analysis showed that soil taken at harvest time from rhizospheres of winter wheat or oats or the foci of aggregation contained more free nitrogen, phosphorus, and potassium than the surrounding soil.

In the second paper the author recommends that tests of the resistance of sugar-beet varieties to *Cercospora beticola* be carried out on two-year-old transplants. The best results were obtained by spraying the leaves of the test plants with a conidial suspension at the rosette stage before flowering, at a minimum temperature of 17° to 18° [C.] and a humidity not less than 94 to 100 per cent.

Weimer (J. L.). **Methods of value in breeding Austrian Winter field Peas for disease resistance in the south.**—*Phytopathology*, xxx, 2, pp. 155–160, 2 figs., 1 graph, 1940.

The failure of most pea varieties to survive winter conditions in Georgia led to the construction of an electrically heated and controlled hot-bed, regulated by thermostats to a temperature of 35° F. A considerable number of plants can be tested by this method for resistance to *Ascochyta pinodella* and *Mycosphaerella pinodes* [*R.A.M.*, xviii, p. 237], severe epidemics of which were produced on four- to five-week-old Austrian Winter seedlings with pure cultures.

Wade (B. L.) & Zaumeyer (W. J.). **Genetic studies of resistance to Alfalfa mosaic virus and of stringiness in Phaseolus vulgaris.**—*J. Amer. Soc. Agron.*, xxxii, 2, pp. 127–134, 1940.

A tabulated account is given of the writer's studies at Charleston, South Carolina, on the inheritance of resistance to lucerne mosaic virus 1 [*R.A.M.*, xvii, p. 721] and stringiness of pods in the F_2 and F_3 of a cross between strains of Corbett Refugee and Great Northern beans (*Phaseolus vulgaris*) and reciprocals. From observations on over 400 F_2 plants and more than 300 F_3 families, resistance to mosaic was concluded to be due to duplicate dominant genes giving a ratio of 15 resistant to 1 susceptible in F_2 and a ratio of 7 resistant to 4 segregating 3 : 1, to 4 segregating 15 : 1, to 1 susceptible in F_3. No correlation was detected between stringiness and mosaic resistance, the former character being due to duplicate recessive genes in which the dominant allelomorphs are complementary.

FEDOTOVA (Mme T. I.). Применение упрощенных серологических реакций в определении устойчивости сортов к заболеваниям. [Application of simplified serological reactions for the determination of varietal resistance to disease.]—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 85–91, 1 fig., 1939.

In further investigations on the determination of varietal resistance of plants to disease by serological methods [*R.A.M.*, xviii, p. 127], the 'ring' reaction was studied in 14 varieties of beans in relation to their resistance to *Bacterium medicaginis*. The technique consists in pouring a thin layer of immunized serum (at a dilution of 1 in 20 or 1 in 40) with the help of a pipette over a layer (2 to 3 drops) of the antigen at the bottom of the test-tube, the most precise results being obtained with antigens stored for 24 hours at 5° to 8° C. after preparation and sera of high titre. The precipitin ring formed where the two liquids touch is either prominent and persistent (type $+_2$), or at first rather ill-defined and later on assuming either more marked outlines or disappearing altogether (type $+_1$); sooner or later both types diffuse and are then designated type $+_3$. Very susceptible varieties gave the type $+_2$ reaction after 10 to 30 minutes, turning into type $+_3$ only after 24 hours or later; slightly susceptible varieties gave the type $+_1$ reaction after 40 minutes to 5 hours, turning into type $+_3$ after 3 to 24 hours; the medium susceptible varieties first formed type $+_1$ rings, which soon turned into $+_2$ and then gradually diffused; while resistant varieties gave no precipitin at all. The ring reaction was strictly specific and gave no precipitate with normal sera. The results obtained by this method agreed entirely with those obtained in agglutination tests, and it is recommended for large-scale practical work. Several experiments with the drop method, which consists in mixing one drop of serum with one drop of antigen on a glass slide, gave unreliable results.

ENKEN (V. B.). Поражаемость Фасоли бактериозами. [The susceptibility of Beans to bacterial diseases.]—*Селекция и семеноводство [Selection & Seed Growing], 1939*, 9, pp. 17–20, 1939.

The following bacteria were isolated at Rostoff-on-Don from samples of diseased beans: *Bacterium phaseoli* (the most widespread species in the U.S.S.R.) [*R.A.M.*, xviii, p. 127], *Bact. phaseoli* var. *fuscans* [ibid., xviii, p. 495], *Bact. medicaginis* var. *phaseolicola* [loc. cit.], *Bact. heteroceum* [ibid., xvi, p. 85], *Bact. vignae* and its var. *leguminophilum* (the last two species having no practical importance); the symptoms caused by each organism are described. In breeding experiments conducted from 1933 to 1936 in the Kuban experiment station (Krasnodar district) it was found that differences in varietal resistance were most manifest at the stage of pod swelling. Of the varieties tested White Haricot Bean, Coco blanc, and Yellow Eye proved to be resistant, and Scotia and Striped Greaseback slightly susceptible.

HEMMI (T.) & KONISHI (S.). **Studies on the Phytophthora rot of Eggplant on the market.**—*Ann. phytopath. Soc. Japan*, ix, 3, pp. 157–169, 1939. [Japanese, with English summary.]

Studies on a rotting of eggplant fruits on the market and in transit

in Japan showed the causal organism to be *Phytophthora melongenae*. Oospores were abundantly present in culture, and were also found in rotted host tissue. In culture, the fungus grew at temperatures ranging from (approximately) 16° to 36° C., the optimum temperature for fruit decay being approximately 28°. At 5° to 6° no infection of wounded fruit occurred. Vigorous growth of aerial mycelium on affected fruit took place in atmospheres of 95 per cent. or more relative humidity, though conidial formation was more abundant at 85 per cent. relative humidity or less than at higher humidities. The fungus was ascertained to be capable of infecting uninjured eggplant fruits and young eggplant seedlings, but it infected tomato and red pepper [*Capsicum annum*] fruits only when the inoculations were effected in needle wounds.

PARK (M.) & FERNANDO (M.). **A variety of Brinjal (Solanum melongena Linn.) resistant to bacterial wilt.**—*Trop. Agriculturist*, xciv, 1, pp. 19–21, 2 pl., 1940.

A description is given of a promising variety of eggplant highly resistant to bacterial wilt (*Bacillus* [*Bacterium*] *solanacearum*) in Ceylon. The seed was obtained from Raitalawela, in Matale South, where this variety (referred to as 'Matale') had been grown for some years. In 1937, when planted alongside an imported variety, Matale developed only 1 per cent. wilt in 1,450 plants, although the susceptible variety was most severely affected, and in another trial, the Matale variety developed only 0·9 per cent. infection, as against 69·1 per cent. infection in the Long Yellow variety, which was used as a control.

The Plant Protection Ordinance (Kenya), 1937. Government Notice No. 127 (1940).—1 p., 1940.

Government Notice No. 127 of 3rd February, 1940, amends Government Notice No. 687 of 2nd September, 1937 [*R.A.M.*, xvii, p. 640] by adding the following diseases [of tobacco], viz., *Bacterium tabacum*, *Bact. angulatum*, and *Cercospora nicotianae*, to those for the prevention or elimination of which in Kenya the Governor in Council is empowered to make regulations.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 2, pp. 33–34, 36, 1940.

GERMANY (PROTECTORATE OF BOHEMIA AND MORAVIA). Decree No. 143 of 19th May, 1939, provides for the compulsory destruction, by proprietors or tenants of land or at their expense, of wild hop bines [against *Pseudoperonospora humuli*].

UNION OF SOUTH AFRICA. With a view to preventing the further extension of bacterial blight of vines (*Bacillus vitivorus*) in South Africa [*R.A.M.*, xviii, p. 768], Proclamation No. 50 of 14th March, 1939, withdraws the exemption of vines in the Cape Province from the restrictions on plant removal and prohibits the removal of vines or other plants or parts thereof of the family Vitaceae within or out of the districts of Somerset West, Stellenbosch, Worcester, and Wynberg, except under a written permit from the Department of Agriculture and Forestry.